Series 1953, No. 2 Issued July 1958

SOIL SURVEY

Potter County Pennsylvania

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
PENNSYLVANIA AGRICULTURAL EXPERIMENT STATION

How to Use THE SOIL SURVEY REPORT

THIS SURVEY of Potter County will help you plan the kind of farming that will protect your soils and provide good yields. It describes the soils; shows their location on a map; and tells what they will do under different kinds of management.

In using this report, you start with the soil map, which consists of the 82 sheets bound in the back of this report. To find your farm on the large map, you use the index to map sheets. This is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located.

When you have found the map sheet for your farm, you will notice that boundaries of the soil have been outlined, and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map.

Suppose you have found on your farm an area marked with the symbol Ca. You learn the name of the soil that this symbol represents by looking at the map legend. The symbol Ca identifies Cattaraugus silt loam, 0 to 12 percent slopes.

Learn About the Soils on Your Farm

Cattaraugus channery loam, 0 to 12 percent slopes, and all the other soils mapped are described in the subsection Soil Series, Types, and Phases. Soil scientists walked over the fields and through the woodlands. They dug holes and examined surface soils and subsoils; measured slopes with a hand level; noted differences in growth of crops, woods, brush, or trees; and, in fact, recorded all the things about the soils that they believed might affect their suitability to farming.

After they mapped and studied the soils, the scientists judged what use and management each soil should have, and then they placed it in a management group. A management group is a group of similar soils that need and respond to about the same kind of management.

Cattaraugus channery loam, 0 to 12 percent slopes, is in management group 1. Turn to the section Management Groups and read what is said about soils of group 1. Table 5 gives suggested management practices for all the soils of the county under their respective management groups. The colored soil maps show the main management groups in different colors. Table 6 gives estimated yields under the prevailing levels of management for some of the soils in management groups 1 to 7.

Make a Farm Plan

For the soils of your farm, compare your yields and farm practices with those given in this report. Look at your fields for signs of runoff and erosion. Then decide whether or not you need to change your methods. The choice, of course, must be yours. This survey will aid you in planning new methods, but it is not a plan of management for your farm or any other farm in the county.

If you find that you need help in farm planning, consult the local representative of the Soil Conservation Service or the county agricultural agent. Members of your State experiment staff and others familiar with the farming in your county will also be glad to help you.

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Issued July 1958

SOIL SURVEY OF POTTER COUNTY, PENNSYLVANIA

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United States Department of Agriculture, Soil Conservation Service, in cooperation with the Pennsylvania State University, College of Agriculture, Agricultural Experiment Station

POTTER COUNTY lies south of and adjacent to the State of New York, midway between the eastern and western boundaries of Pennsylvania (fig. 1). It covers a land area of 1,092 square miles, or 698,880 acres. Hardwoods have replaced the original forest over most of this area, and almost the entire southern half of the county is in State forest. The county is a high, dissected plateau. Its climate is cool and humid. Lumbering dominated in the early history of Potter County, but farming has replaced lumbering as the chief enterprise. The principal types of farming are dairying, general farming, livestock raising, and potato growing. The leading crops are hay, oats, potatoes, and corn for silage. This survey was made primarily to aid farmers in planning the best use of their soils. It can also be used by foresters, engineers, tax assessors, and others. It is a cooperative work of the United States Department of Agriculture and the Pennsylvania State University Agricultural Experiment Station. Fieldwork was completed in 1953. Unless otherwise specified, all statements in this report refer to conditions at that time.

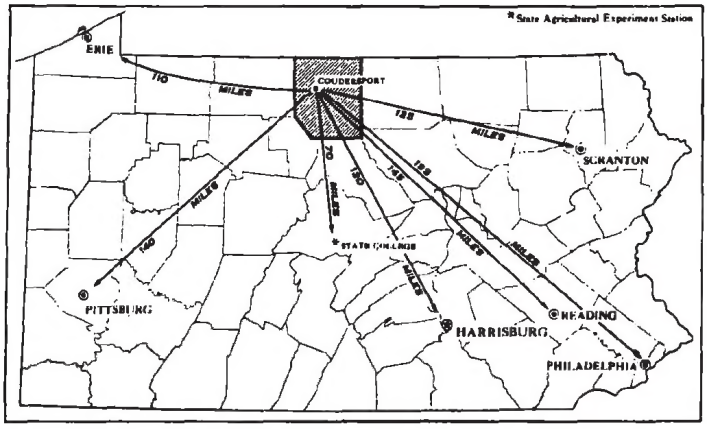

Figure 1.—Location of Potter County in Pennsylvania.

The Soils of Potter County

The soils of Potter County were formed from five general kinds of parent material: (1) Glacial till;

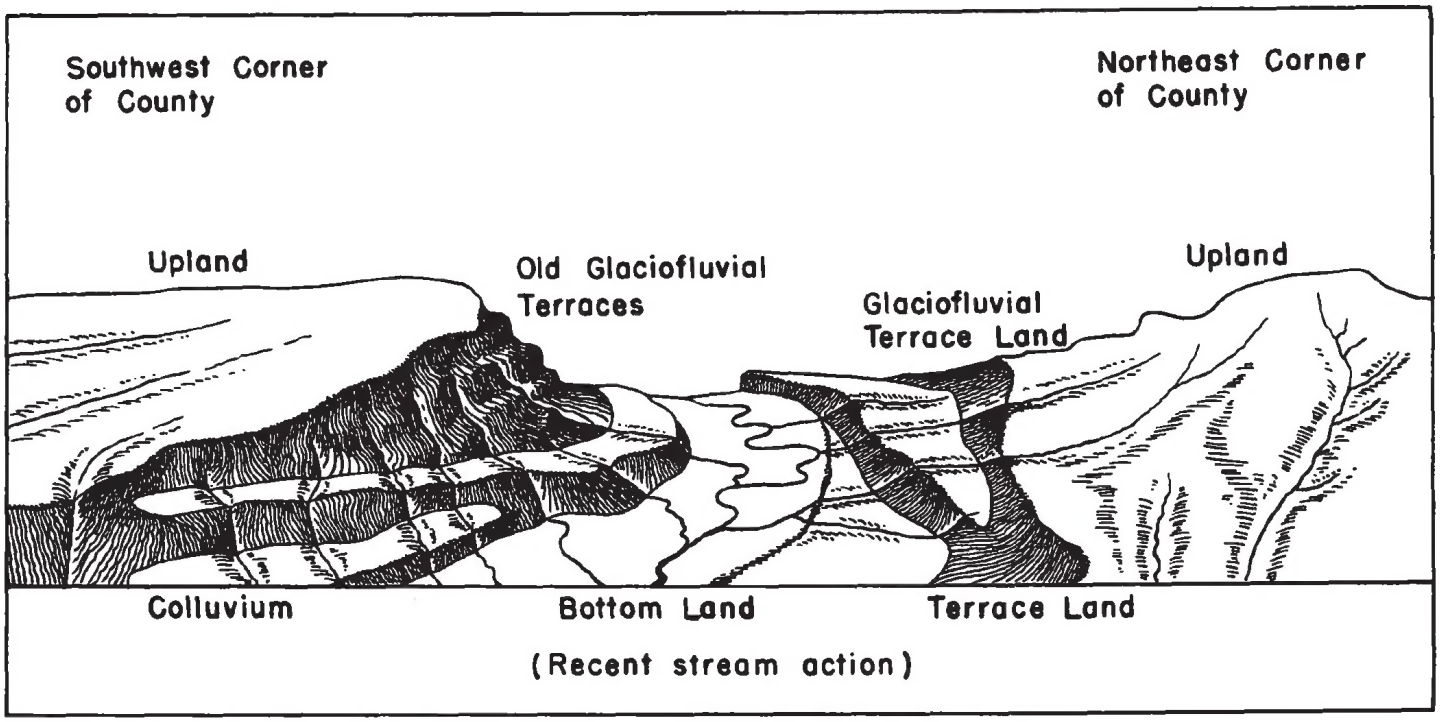

Figure 2.—Topography of a section of Potter County.

(2) channery and flaggy rubble in deep accumulations caused by frost action; (3) residuum from rocks weathered in place; (4) alluvium from stream action or glacial melt water; and (5) organic deposits in a few scattered bogs. The soils formed from these materials occur in bottom lands, on terraces, and on uplands (*12*).[1] The bottom lands consist of stream fans or colluvium, and the terraces are old glaciofluvial formations that were left by extinct melt-water streams of ancient glaciers. Figure 2 shows relative topographic positions in the county.

Soil Associations

A soil association consists of soils that occur together in a characteristic pattern (*11*). By delineating these geographically associated soils, a generalized map that shows areas dominated by the soils of two or more series can be prepared. The soils of Potter County have been placed in nine soil associations (fig. 3). Each association has geographic boundaries that are fairly well defined.

A soil association may consist of a few or of many soils. The soils may be similar or they may represent many different types. Soils not alike frequently occur side by side in a soil association, but each soil association has a pattern of soils that occurs repeatedly.

The use of a particular soil may be greatly influenced by the suitability of the other soils of a soil association. A soil suited to corn may or may not be used for that crop, depending on whether or not the other soils of the association are suited to corn. This is particularly true of soils that compose small parts of a soil association.

If a soil survey is to be used in broad land programs, it is important to know what soils occur together, as well as the detailed characteristics of the individual soils. Knowledge of what soils occur together is also useful in learning to identify the soils of an area, to understand their distribution, and to interpret and predict their relationships to agriculture.

A brief discussion of each soil association of the county follows. Detailed information about the soils that compose each association is given in the individual soil descriptions.

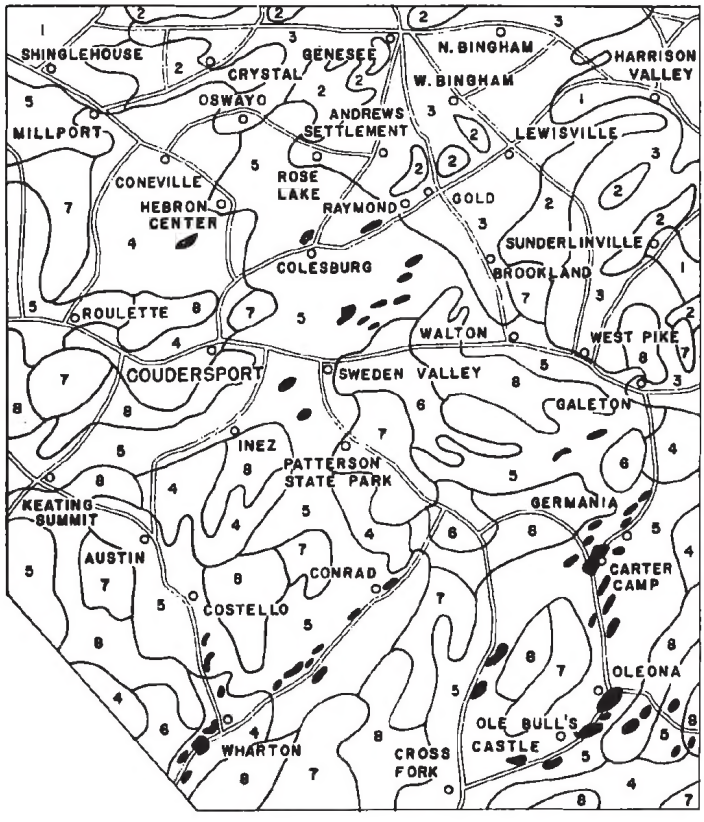

Figure 3.—Soil associations of Potter County

1. Volusia-Mardin
2. Lordstown-Oquaga
3. Cattaraugus-Culvers-Morris
4. Bath-Mardin
5. Lackawanna-Wellsboro-Cattaraugus-Culvers
6. Wharton-Cavode-Chippewa
7. Leetonia-Dekalb
8. Clymer-Cookport-Dekalb
9. Germania-Sweden (not numbered on map; shown by black spots)

[1] Italic numbers in parentheses refer to Literature Cited, p. 89.

Volusia-Mardin association (1)

The soils of this association are mottled gray and yellow and brown. They developed from glacial till and are plastic and sticky and slightly limy in the subsoil. This association prevails in the northwestern corner of Sharon Township and in the northeastern corner of Harrison Valley Township. Because these soils are better suited to clover, grasses, and small grains than to row crops, this association is suited to dairy farming and the raising of livestock.

Lordstown-Oquaga association (2)

The soils of this association are mainly shallow to bedrock. They are scattered across the highlands and areas that have exposed bedrock in the northeastern part of the county. Most of the soils are forested, but a few acres are used for potatoes and oats. In these areas subsistence farms prevail, and wood cutting is important on most of them.

Cattaraugus-Culvers-Morris association (3)

The soils of this association developed from deep, reddish-brown glacial till and frost-worked materials, to which scientists apply the term periglacial. Because these soils lead in crop production and are well suited to most crops of the area, this association is well suited to general farming. The wet Morris soils, however, require drainage and are better suited to pasture and grain than to row crops.

Bath-Mardin association (4)

The soils of this association are yellow and brown, very acid, and deep. They are well drained to moder-

ately well drained. The soils are well suited to potatoes, strawberries, and small fruits, and small grains. This association therefore is suited to specialized potato and berry farms.

Lackawanna-Wellsboro-Cattaraugus-Culvers association (5)

The soils of this association are on deep, reddish glacial till and frost-worked materials. They are widely distributed throughout the county but occur mainly in the valleys and low uplands of the southern and southwestern parts. Most crops suited to the area, including grasses, small grains, and small fruits, grow well on these soils. Small areas of wet soils, however, require drainage for row crops. This soil association is well suited to general and specialized farming.

Wharton-Cavode-Chippewa association (6)

The soils of this association are on moderately deep residual accumulations that come from dark-brown or gray shale and siltstone. These sticky and plastic soils are poorly suited to row crops. They are best suited to pasture, hay, or timber. Areas of this soil association that are cleared can be used for livestock farms, but most areas are timbered and should remain so.

Leetonia-Dekalb association (7)

This association has the coarsest and most droughty soils in the county. The soils are extremely acid (pH less than 4.5) and sandy. They include many large stones and boulders of quartz conglomerate. Except for a few small areas of the medium-textured and less stony Dekalb soils, these soils are suited only to forest. If Dekalb soils are cultivated, potatoes and small fruits are the best crops.

Clymer-Cookport-Dekalb association (8)

Soils of this association occur on deep to shallow, yellowish or yellowish-brown residual accumulations derived from fine- to coarse-textured sandstone. The Clymer and Dekalb soils are extremely acid (pH less than 4.5) and somewhat droughty. The Cookport soils are moderately well drained to somewhat poorly drained. This association is suited to potatoes, small fruits, small grains, and pasture, but its best use is for forest.

Germania-Sweden association (9)

This association consists of soils that occur on two different kinds of parent material, each of which has similar color and weathering. The materials are yellowish red. They contain deeply weathered, soft, rotten rock and pebbles that indicate a much longer period of soil development than the parent material of the soils of the rest of the county. Soils of this association occur both on colluvium and terrace deposits along valley walls and near ridgetops in sequestered nooks. Generally they are well drained and strongly acid. They are well suited to general crops and some fruits. Areas of this association are small and scattered, however, and are used like the surrounding areas.

Soil Series, Types, and Phases

In the following pages the soils of Potter County are described in detail and their agricultural relations are discussed. Their location and distribution are shown on the soil map bound at the back of this report. Their approximate acreage and proportionate extent are given in table 1.

Barbour Series

The internally well drained, deep Barbour soils occur on stream flood plains. They are flooded periodically but remain above water most of summer and fall. These soils are along all the main streams that drain large areas where the soils were dominantly derived from red sandstone, siltstone, and shale, mostly of the Catskill formation (*12*). Barbour soils are associated on flood plains with moderately well drained Basher and poorly drained Holly soils. They are also associated with Tunkhannock and Vrooman soils of the nearby terraces.

Barbour fine sandy loam, 0 to 3 percent slopes (Ba; group 4A)[2].—The following is a representative profile:

Surface soil—
Red or reddish-brown, very friable, strongly acid fine sandy loam; weak medium granular structure; layer about 6 to 14 inches thick.

Subsoil—
Red or dark-red, strongly acid, friable fine sandy loam; weak fine granular structure or in some places structureless; fine sandy loam grades into moderately loose and structureless strongly acid sandy loam; layer may extend to depth of 28 inches.

Substratum—
Alternating layers of reddish sand and gravel to an average depth of 48 inches or more; depths to underlying bedrock, hard material, or compact till range from 36 to 60 inches or more.

The permeability of the soil to water is rapid to moderately rapid.

Use and management.—Because frequent floods damage row crops, most farmers keep this soil in pasture or hay. The soil lies along water that cattle can drink. When not flooded during the growing season, this soil can be used for row crops. It responds well to lime and fertilizer. This soil occurs in the glaciated valley shown in figure 4, page 6.

[2] The letter symbol (Ba) designates the soil as shown on the detailed soil map; the arabic number and capital letter (4A) designates the management group in which the soil has been placed.

TABLE 1.—*Approximate acreage and proportionate extent of the soils mapped*

Soil	Acres	Percent
Barbour fine sandy loam, 0 to 3 percent slopes	921	0.1
Barbour fine sandy loam, high bottom phase, 0 to 3 percent slopes.	1,055	.2
Barbour gravelly fine sandy loam, 0 to 3 percent slopes.	1,123	.2
Basher sandy loam, 0 to 3 percent slopes	1,450	.2
Basher silt loam, 0 to 3 percent slopes	874	.1
Basher silt loam, high bottom phase, 0 to 3 percent slopes.	977	.1
Bath channery silt loam, 0 to 12 percent slopes	7,202	1.0
Bath channery silt loam, 12 to 20 percent slopes	2,843	.4
Bath channery silt loam, 20 to 30 percent slopes	2,853	.4
Bath channery silt loam, 30 to 40 percent slopes	2,463	.4
Braceville gravelly silt loam, 0 to 5 percent slopes	813	.1
Brinkerton and Armagh silt loams, 0 to 15 percent slopes.	963	.1
Brinkerton and Armagh silt loams, 15 to 50 percent slopes	71	(1)
Cattaraugus channery loam, 0 to 12 percent slopes.	15,658	2.2
Cattaraugus channery loam, 12 to 20 percent slopes.	13,016	2.0
Cattaraugus channery loam, 20 to 30 percent slopes.	18,634	2.7
Cattaraugus channery loam, 30 to 40 percent slopes.	33,209	4.8
Cattaraugus stony loam, 0 to 20 percent slopes	2,073	.3
Cattaraugus stony loam, 20 to 30 percent slopes	1,702	.2
Cattaraugus and Lackawanna channery loams, 40 to 60 percent slopes.	62,962	9.0
Cattaraugus and Lackawanna stony loams, 30 to 60 percent slopes.	24,068	3.5
Cavode channery silt loam, 0 to 8 percent slopes	1,859	.3
Cavode channery silt loam, 8 to 15 percent slopes	472	.1
Cavode channery silt loam, 15 to 25 percent slopes	108	(1)
Cavode silt loam, 0 to 8 percent slopes	826	.1
Cavode silt loam, 8 to 15 percent slopes	171	(1)
Cavode silt loam, 15 to 25 percent slopes	51	(1)
Cavode stony silt loam, 0 to 15 percent slopes	1,212	.2
Cavode stony silt loam, 15 to 50 percent slopes	119	(1)
Chenango gravelly loam, 0 to 12 percent slopes	785	.1
Chenango gravelly loam, 12 to 20 percent slopes	97	(1)
Chenango gravelly loam, 20 to 50 percent slopes	143	(1)
Chippewa silt loam, 0 to 8 percent slopes	772	.1
Chippewa stony silt loam, 0 to 8 percent slopes	740	.1
Clymer channery loam, 0 to 12 percent slopes	8,626	1.2
Clymer channery loam, 12 to 20 percent slopes	1,772	.3
Clymer channery loam, 20 to 30 percent slopes	904	.1
Clymer stony loam, 0 to 20 percent slopes	10,439	1.5
Clymer stony loam, 20 to 30 percent slopes	2,018	.3
Cookport channery loam, 0 to 8 percent slopes	3,231	.5
Cookport channery loam, 8 to 15 percent slopes	735	.1
Cookport channery loam, 15 to 25 percent slopes	77	(1)
Cookport stony loam, 0 to 15 percent slopes	14,055	2.0
Cookport stony loam, 15 to 25 percent slopes	1,638	.2
Cookport stony loam, 25 to 50 percent slopes	798	.1
Culvers channery silt loam, 0 to 8 percent slopes	14,614	2.1
Culvers channery silt loam, 8 to 15 percent slopes	14,489	2.1
Culvers channery silt loam, 15 to 25 percent slopes	8,007	1.2
Culvers channery silt loam 25 to 35 percent slopes	1,937	.3
Culvers stony silt loam, 0 to 15 percent slopes	6,842	1.0
Culvers stony silt loam, 15 to 25 percent slopes	3,172	.5
Culvers stony silt loam, 25 to 35 percent slopes	1,010	.1
Culvers and Wellsboro channery silt loams, 35 to 50 percent slopes.	331	(1)
Dekalb channery loam, 10 to 25 inches deep, 0 to 12 percent slopes.	3,587	.5
Dekalb channery loam, 10 to 25 inches deep, 12 to 20 percent slopes.	1,448	.2
Dekalb channery loam, 10 to 25 inches deep, 20 to 30 percent slopes.	1,187	.2
Dekalb channery loam, 40 or more inches deep, 0 to 12 percent slopes.	8,395	1.2
Dekalb channery loam, 40 or more inches deep, 12 to 20 percent slopes.	4,419	.6
Dekalb channery loam, 40 or more inches deep, 20 to 30 percent slopes.	5,293	0.8
Dekalb channery loam, 40 or more inches deep, 30 to 40 percent slopes.	11,397	1.6
Dekalb fine sandy loam, 0 to 12 percent slopes	1,598	.2
Dekalb fine sandy loam, 12 to 20 percent slopes	216	(1)
Dekalb fine sandy loam, 20 to 30 percent slopes	54	(1)
Dekalb stony loam, 10 to 25 inches deep, 0 to 20 percent slopes.	3,053	.4
Dekalb stony loam, 10 to 25 inches deep, 20 to 30 percent slopes.	1,200	.2
Dekalb stony loam, 40 or more inches deep, 0 to 20 percent slopes.	4,151	.6
Dekalb stony loam, 40 or more inches deep, 20 to 30 percent slopes.	2,451	.4
Dilldown sandy loam, 0 to 12 percent slopes	96	(1)
Dilldown sandy loam, 12 to 30 percent slopes	106	(1)
Germania silt loam, 0 to 12 percent slopes	375	.1
Germania silt loam, 12 to 20 percent slopes	297	(1)
Germania silt loam, 20 to 30 percent slopes	274	(1)
Germania silt loam, 30 to 50 percent slopes	164	(1)
Holly sandy loam, 0 to 3 percent slopes	1,669	.2
Holly silt loam, 0 to 3 percent slopes	4,845	.7
Lackawanna channery loam, 0 to 12 percent slopes.	1,055	.2
Lackawanna channery loam, 12 to 20 percent slopes.	759	.1
Lackawanna channery loam, 20 to 30 percent slopes.	645	.1
Lackawanna channery loam, 30 to 40 percent slopes.	400	.1
Lackawanna channery silt loam, 0 to 12 percent slopes.	10,738	1.5
Lackawanna channery silt loam, 12 to 20 percent slopes.	13,242	1.9
Lackawanna channery silt loam, 20 to 30 percent slopes.	19,130	2.7
Lackawanna channery silt loam, 30 to 40 percent slopes.	36,820	5.3
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 0 to 12 percent slopes.	1,959	.3
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 12 to 20 percent slopes.	873	.1
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 20 to 30 percent slopes.	814	.1
Lackawanna stony loam, 0 to 20 percent slopes	427	.1
Lackawanna stony loam, 20 to 30 percent slopes	527	.1
Leetonia channery loamy sand and Dekalb channery loam, 30 to 60 percent slopes.	19,955	2.9
Leetonia stony loamy sand, 0 to 20 percent slopes.	13,776	2.0
Leetonia stony loamy sand, 20 to 30 percent slopes.	1,308	.2
Leetonia and Dekalb very stony soils, 0 to 20 percent slopes.	1,247	.2
Leetonia and Dekalb very stony soils, 20 to 30 percent slopes.	522	.1
Leetonia and Dekalb very stony soils, 30 to 70 percent slopes.	37,559	5.4
Lordstown channery silt loam, 0 to 12 percent slopes.	1,530	.2
Lordstown channery silt loam, 12 to 20 percent slopes.	620	.1
Lordstown channery silt loam, 20 to 30 percent slopes.	822	.1
Lordstown channery silt loam, 30 to 40 percent slopes.	1,698	.2
Lordstown channery silt loam, neutral variant, 0 to 30 percent slopes.	47	(1)
Lordstown stony loam, 0 to 20 percent slopes	1,418	.2
Lordstown stony loam, 20 to 30 percent slopes	474	.1
Lordstown and Bath channery silt loams, 40 to 60 percent slopes.	5,535	.8
Mardin channery silt loam, 0 to 8 percent slopes.	15,625	2.2
Mardin channery silt loam, 8 to 15 percent slopes.	9,023	1.3

TABLE 1.—*Approximate acreage and proportionate extent of the soils mapped*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Mardin channery silt loam, 15 to 25 percent slopes	5,276	.8	Tunkhannock flaggy loam, 3 to 20 percent slopes	2,213	.3
Mardin channery silt loam, 25 to 35 percent slopes	3,360	.5	Tunkhannock flaggy loam, 20 to 30 percent slopes	482	.1
Middlebury sandy loam, 0 to 3 percent slopes	1,433	.2	Tunkhannock flaggy loam, 30 to 50 percent slopes	215	(1)
Middlebury silt loam, 0 to 3 percent slopes	850	.1	Tunkhannock gravelly loam, 0 to 12 percent slopes.	2,879	.4
Middlebury silt loam, high bottom phase, 0 to 3 percent slopes.	1,038	.2	Tunkhannock gravelly loam, 12 to 20 percent slopes.	232	(1)
Minora silt loam, 0 to 12 percent slopes	360	(1)	Unadilla fine sandy loam, 0 to 3 percent slopes	353	(1)
Minora silt loam, 12 to 20 percent slopes	117	(1)	Unadilla silt loam, 0 to 3 percent slopes	107	(1)
Minora silt loam, 20 to 30 percent slopes	148	(1)	Volusia channery silt loam, 0 to 3 percent slopes	169	(1)
Mixed alluvium, 0 to 5 percent slopes	7,037	1.0	Volusia channery silt loam, 3 to 8 percent slopes	3,824	.6
Morris silt loam, 0 to 3 percent slopes	505	.1	Volusia channery silt loam, 8 to 15 percent slopes	3,722	.5
Morris silt loam, 3 to 8 percent slopes	9,001	1.3	Volusia channery silt loam, 15 to 25 percent slopes	845	.1
Morris silt loam, 8 to 15 percent slopes	5,768	.8	Volusia channery silt loam, 25 to 40 percent slopes	728	.1
Morris silt loam, 15 to 25 percent slopes	1,182	.2	Volusia flaggy silt loam, 0 to 8 percent slopes	729	.1
Morris silt loam, 25 to 50 percent slopes	191	(1)	Volusia flaggy silt loam, 8 to 15 percent slopes	1,269	.2
Morris stony silt loam, 0 to 15 percent slopes	5,804	.8	Volusia flaggy silt loam, 15 to 25 percent slopes	757	.1
Morris stony silt loam, 15 to 25 percent slopes	430	.1	Vrooman fine sandy loam, 0 to 3 percent slopes	406	.1
Morris stony silt loam, 25 to 50 percent slopes	73	(1)	Vrooman silt loam, 0 to 3 percent slopes	109	(1)
Nolo channery silt loam, 0 to 8 percent slopes	440	.1	Wellsboro channery silt loam, 0 to 8 percent slopes.	4,477	.6
Nolo stony sandy loam, sandy variant, 0 to 12 percent slopes.	1,845	.3	Wellsboro channery silt loam, 8 to 15 percent slopes.	5,903	.8
Norwich silt loam, 0 to 15 percent slopes	896	.1	Wellsboro channery silt loam, 15 to 25 percent slopes.	2,760	.4
Norwich stony silt loam, 0 to 15 percent slopes	1,032	.2	Wellsboro channery silt loam, 25 to 35 percent slopes.	370	.1
Oquaga channery loam, 0 to 12 percent slopes	3,188	.5	Wellsboro stony loam, 0 to 15 percent slopes	414	.1
Oquaga channery loam, 12 to 20 percent slopes	1,771	.3	Wellsboro stony loam, 15 to 25 percent slopes	196	(1)
Oquaga channery loam, 20 to 30 percent slopes	2,410	.3	Wellsboro stony loam, 25 to 35 percent slopes	58	(1)
Oquaga channery loam, 30 to 50 percent slopes	27,762	4.0	Wharton channery silt loam, 0 to 12 percent slopes.	2,680	.4
Oquaga stony loam, 0 to 20 percent slopes	1,573	.2	Wharton channery silt loam, 12 to 20 percent slopes.	589	.1
Oquaga stony loam, 20 to 30 percent slopes	779	.1	Wharton channery silt loam, 20 to 30 percent slopes.	253	(1)
Oquaga stony loam, 30 to 60 percent slopes	17,769	2.5	Woostern gravelly loam, 0 to 12 percent slopes	707	.1
Papakating silt loam, 0 to 3 percent slopes	858	.1	Woostern gravelly loam, 12 to 20 percent slopes	573	.1
Peat and muck, undifferentiated, 0 to 3 percent slopes.	40	(1)	Woostern gravelly loam, 20 to 30 percent slopes	702	.1
Red Hook silt loam, 0 to 3 percent slopes	1,429	.2	Woostern gravelly loam, 30 to 50 percent slopes	528	.1
Riverwash, 0 to 3 percent slopes	742	.1	Total	698,880	100.0
Scio fine sandy loam-silt loam, 0 to 3 percent slopes.	1,143	.2			
Sweden loam, 0 to 12 percent slopes	240	(1)			
Sweden stony loam, 0 to 12 percent slopes	216	(1)			
Tioga fine sandy loam, 0 to 3 percent slopes	551	.1			
Tioga fine sandy loam, high bottom phase, 0 to 3 percent slopes.	332	(1)			
Tioga gravelly loam, 0 to 3 percent slopes	239	(1)			

[1] Less than 0.1 percent.

Barbour fine sandy loam, high bottom phase, 0 to 3 percent slopes (Bb; group 4A).—This soil is similar to Barbour fine sandy loam, 0 to 3 percent slopes, but it is flooded less often. A greater part of the soil therefore is used for row crops, mainly corn, beans, and some potatoes. Included are a few areas that have not been flooded for many years. These areas more resemble Vrooman and Tunkhannock soils of the older terraces than they do Barbour fine sandy loam, high bottom phase.

Barbour gravelly fine sandy loam, 0 to 3 percent slopes (Bc; group 4A).—The acreage of this soil is small and mainly occurs along streams as natural levees that are elongated and narrow.

Representative profile:

Surface soil—
Red or reddish-brown, loose and structureless, strongly acid gravelly fine sandy loam; contains pebbles 2 to 3 inches in diameter; layer is about 7 inches thick.

Subsoil—
Red or dark-red, loose and structureless, strongly acid gravelly sandy loam; layers may extend to depths of 13 or 14 inches.

Substratum—
Reddish-brown or reddish-yellow alternating layers of pebbles, cobblestones, and sand that are easily separated when the soil is displaced; layer extends to depth of 48 inches, but range in depth to bedrock, hard material, or compact till is 36 to 60 inches or more.

Use and management.—Because areas of this gravelly soil are normally too small to be used alone, they are generally used with Barbour fine sandy loam, 0 to 3 percent slopes. Areas of Barbour gravelly fine sandy loam large enough for crops are more droughty and slightly less fertile than the fine sandy loam. Fertilization and other management are similar on these two soils.

Basher Series

The moderately well drained, deep Basher soils occur on stream flood plains that consist mainly of reddish sandstone and siltstone of the Catskill formation.

Figure 4.—Glaciated area near Louck's Mills in a wide U-shaped valley characteristic of drift areas (*12*). A small stream flows through this valley. Barbour fine sandy loam, 0 to 3 percent slopes, occupies the foreground, and several Cattaraugus soils are in the background.

These soils overflow periodically and remain somewhat wet much of spring. Basher soils are also on many of the flats on the bottom lands, where they are adjacent to the natural levees occupied by the well-drained Barbour soils. On the flood plains Basher soils are closely associated with poorly drained Holly soils, as well as the Barbour soils.

Basher sandy loam, 0 to 3 percent slopes (Bd; group 4B).—The following is a representative profile:

Surface soil—
Dark-brown or reddish-brown, loose, strongly acid sandy loam; weak medium granular structure; layer about 6 inches thick and extends into a friable sandy loam that may have a weak thin platy structure; depth of surface soil may be 14 inches or more.

Subsoil—
Light yellowish-brown, slightly to strongly mottled with yellow and red, firm, strongly acid fine sandy loam; structure may be weak thick platy; between depths of 21 and 31 inches, fine sandy loam grades to a mottled brown, yellow, and reddish-yellow, firm gravelly sandy loam.

Substratum—
Mottled reddish-brown and yellow, very firm, strongly acid alternate layers of sand and gravel; normal depth to bedrock, hard material, or till is 48 inches or more; depths range from 36 to 60 inches or more.

The permeability of the soil to water is moderate to moderately slow.

Use and management.—This soil is well suited to pasture and hay, but generally it is not well enough drained for row crops. Small areas with better than normal natural or artificial drainage can be used for corn, beans, and some vegetables. Most of the soil is used for pasture or hay. It responds well to topdressings of lime, phosphorus, and nitrogen.

Basher silt loam, 0 to 3 percent slopes (Be; group 4B).—The following is a representative profile:

Surface soil—
Reddish-brown or yellowish-brown, friable, strongly acid silt loam; weak fine to moderately strong medium granular structure; layer 5 to 10 inches thick.

Subsoil—
Slightly to strongly mottled reddish-brown or reddish-yellow, strongly acid silty clay loam; very firm, hard when dry; massive or structureless; layer may extend to depths of 14 to 20 inches.

Substratum—
Strong-brown, strongly acid, firm or friable and structureless gravelly fine sandy loam; average depth to hard material is about 4 feet, but depths range from 3 to 5 feet or more.

The permeability of the soil to water is moderately slow.

Use and management.—This soil is best suited to pasture. It is not sufficiently drained, nor can it be conveniently drained for row crops, but a large part is used for small grains. Pasture on this soil has very good carrying capacity if lime, phosphorus, and nitrogen are applied.

Basher silt loam, high bottom phase, 0 to 3 percent slopes (Bf; group 4B).—This soil is similar to Basher silt loam, 0 to 3 percent slopes, but it occurs on large stream bottoms in places that are not flooded so frequently. Some areas are flooded so rarely that the soil is cleared and used for corn, oats, and beans. But this soil is mostly used for pasture, hay, and small grains, for which it is well suited. The soil is poorly suited to orchard fruits, peas, and other crops that require good drainage. When corn, oats, and beans are adequately limed and fertilized, yields are high. For corn and beans most farmers use complete fertilizer, manure, and finely ground limestone.

Bath Series

The well-drained, deep to very deep Bath soils occur in the uplands on glacial till or frost-worked (periglacial) materials. These materials contain much grayish sandstone and siltstone of the Pocono formation (*12*). The soils are in large areas on hilltops and along valley walls in the central, northwestern, and northeastern parts of the county. Bath soils occur in association with the moderately well drained Mardin, well-drained Woostern, and poorly drained Volusia soils.

Bath channery[3] silt loam, 0 to 12 percent slopes (Bg; group 1).—An area of this soil that has many stone fragments on the surface is shown in figure 5.

Representative profile:

Surface soil—
Dark grayish-brown or yellowish-brown, strongly or very strongly acid, friable channery silt loam; moderately strong fine to medium granular structure; layer normally about 6 inches thick.

Subsoil—
Yellowish-brown, strongly acid, friable to very firm channery silt loam; moderately strong or weak firm subangular blocky structure; (in some profiles lower subsoil is medium subangular blocky); subsoil extends to depths of 13 to 26 inches.

Substratum—
Olive-yellow or light yellowish-brown, strongly or very strongly acid, firm and, in places, compact channery silt loam or flaggy loam; average depth to bedrock about 5 feet but depths may range from 3 to 10 feet or more.

[3] Channery soils are those that contain many fragments of flat sandstone, limestone, or schist as large as 6 inches along the longer axis.

Figure 5.—Bath channery silt loam.

The permeability of the soil to water is rapid to moderately rapid.

In the northeastern part of the county the substratum grades into olive-yellow, gritty and sandy, firm, channery glacial till of silt loam texture.

Use and management.—Because it is well suited to most crops of the area, this is an important soil. The main crops are potatoes, oats, beans, and corn. Barley, buckwheat, and winter wheat are extensively grown. Some peas are grown for canning. Good stands of timothy and clover are grown for hay, and pastures are normally clover or mixed grasses. This soil responds well to heavy applications of lime, nitrogen, and complete fertilizer. When these amendments are applied, yields are high, especially for potatoes and oats.

Bath channery silt loam, 12 to 20 percent slopes (Bh; group 5).—Except for its stronger slope, this soil is similar to and produces about the same type of crops as Bath channery silt loam, 0 to 12 percent slopes. For row crops the soil requires long rotations or contour tillage and stripcropping. Because air drainage is better on this sloping soil than on Bath channery silt loam, 0 to 12 percent slopes, it is better suited to orchards.

Bath channery silt loam, 20 to 30 percent slopes (Bk; group 11A).—Much of this moderately steep soil is along the sides of valleys in the central and southern parts of the county. Little is actually tilled, but a large part is cleared. The cleared soil is mostly idle or in pasture, old hayfields, and old orchards. Large areas are and should remain in forest, because this soil is better suited to timber than to crop production.

Bath channery silt loam, 30 to 40 percent slopes (Bm; group 13B).—This soil occurs primarily along the sides of valleys in the southern part of the county. Cleared areas are mostly old hayfields, old orchards, or pastures. The soil is much too steep for row crops and should be kept in forest.

Braceville Series

The only Braceville soil mapped in the county is Braceville gravelly silt loam, 0 to 5 percent slopes. This moderately well drained, very deep soil is on glaciofluvial terraces and fans. It occurs in the northern part of the county along the Genesee and Cowanesque Rivers and Oswayo Creek. It is situated in slight depressions and broad low areas on well-developed terraces. The Braceville soil is associated with the Chenango soils on terraces similar to those occupied by the Chenango. On other terraces it is associated with the well-drained Tunkhannock and poorly drained Red Hook soil.

Braceville gravelly silt loam, 0 to 5 percent slopes (Bn; group 3).—The following is a representative profile:

Surface soil—
Dark-brown, strongly acid, very friable gravelly silt loam; weak coarse granular structure; layer about 7 inches thick.

Subsoil—
Yellowish-red gravelly silt loam or loam, mottled with yellow, yellowish brown, and brown; strongly acid; firm to very firm; structure may be weak medium granular; layer extends to a depth of about 26 inches.

Substratum—
Mottled yellowish-brown and brown, firm, strongly acid layers of gravel and sand that may extend to depths of 4 to 15 feet or more; average depth to hard material is about 6 feet.

The permeability of the soil to water is moderate.

Use and management.—This soil is generally too wet for row crops, but it is widely used for small grains, pasture, and hay. It responds well to lime, nitrogen, and phosphorus.

Brinkerton and Armagh Series

In Potter County the soils of the Brinkerton and Armagh series are shown on the map in two soil units —Brinkerton and Armagh silt loams, 0 to 15 percent slopes, and Brinkerton and Armagh silt loams, 15 to 50 percent slopes. The principal soils of these undifferentiated units are the Brinkerton, and included with them are small spots of Armagh soils.

Brinkerton and Armagh soils are not shown separately on the map, because their profiles are almost identical to depths of 24 to 30 inches. Below these depths, however, the Armagh soils contain bedded clay shales, and the Brinkerton, loose stones. Furthermore the Brinkerton is deeper to bedrock.

These poorly drained, deep Brinkerton and Armagh soils occur in the uplands on very firm or compact frost-worked materials or glacial till. This parent material was derived primarily from fine-grained sandstone, siltstone, and shale of the Pocono formation. The soils occur mainly in the central and southeastern parts of the county. They are situated in basins, on gentle slopes, and around the headwaters of streams in high parts of the Allegheny Plateau where gray shale and sandstone dominate.

Brinkerton soils occur in association largely with well-drained Bath, moderately well-drained Mardin, and very poorly drained Chippewa soils.

Brinkerton and Armagh silt loams, 0 to 15 percent slopes (Bo; group 8A).—The following profile description of Brinkerton silt loam, 0 to 15 percent slopes,

is representative of the Brinkerton part of this undifferentiated soil unit:

Surface soil—
Some areas may have 2 or 3 inches of organic material on the surface; the mineral soil is dark grayish brown, very strongly acid friable silt loam; strong medium granular structure; layer may extend to depth of 8 inches.
Subsoil—
Mottled gray, yellow, and brown, very strongly acid, firm silty clay loam; plastic when wet; layer grades into intensely mottled gray and pale-yellow very firm silty clay loam; very hard when dry; layer contains dark-brown soft concretions about 1/32 inch in diameter; subsoil may extend as deep as 22 inches from the surface.
Substratum—
Mottled gray and brown, strongly acid, compact gritty clay loam; plastic when wet, very hard when dry; layer grades into weathered glacial till or frost-worked materials that contain much gray shale and siltstone; average depth of soil about 4 feet, but depths range from 3 to 6 feet.

In the lower subsoil the permeability to water is slow to very slow.

Use and management.—These poorly drained soils are not suited to row crops, but one small area has been drained and cultivated. Much of this unit is cleared and used for pastures and hay, for which it is moderately well suited. These soils are best suited to pasture or forest. Most of the unit is in forest.

If cleared for pasture, hay, or small grains, these soils require drainage and large applications of lime, nitrogen, and phosphorus. For potatoes much complete fertilizer is also needed. The soils are generally not suited to such crops as orchard fruits, peas, and alfalfa.

Brinkerton and Armagh silt loams, 15 to 50 percent slopes (Bp; group 14B).—These soils occur on steep valley walls that have springs and seep spots. In other respects they are similar to Brinkerton and Armagh silt loams, 0 to 15 percent slopes. Despite a more rapid runoff, the soils stay wet most of the time because of poor internal drainage. They are very hard when dry and difficult to till. Most of these soils are less than 30 percent in slope. They are generally pastured, but some areas are timbered or idle. A few scattered areas with slopes as steep as 50 percent occur along the banks of streams and along the Plateau escarpment (*12*). These areas are and should remain in forest.

Cattaraugus Series

The well-drained, deep to very deep Cattaraugus soils of the uplands occur on moderately loose to very firm and slightly compact Wisconsin glacial till or on frost-worked materials. The till contains some shale, and many subangular and rounded fragments of sandstone and siltstone. These fragments are from the Catskill formation. The till also contains pebbles and cobbles of granite, gneiss, chert, and quartzite. The frost-worked materials are primarily red, green, or gray, angular and subangular channers and flagstones derived from the Catskill and Pocono formations.

The Cattaraugus soils are among the most extensive in the county and cover much of the north-central and central part. They occur in association with and on material similar to that of the moderately well drained Culvers and poorly drained Morris soils. Large areas of Cattaraugus, Culvers, and Morris soils lie east of Genesee along the North Bingham road.

Cattaraugus channery loam, 0 to 12 percent slopes (Ca; group 1).—The following is a representative profile:

Surface soil—
Reddish-brown or yellowish-red, extremely to strongly acid, friable channery loam; weak fine to medium granular structure; layer 6 to 11 inches thick.
Subsoil—
Yellowish-red or strong-brown, extremely to strongly acid channery loam; firm, and, in some places, compact; weak medium subangular blocky structure; layer may extend as deep as 24 inches and may be flaggy in some places.
Substratum—
Dark reddish-brown or yellowish-red, very strongly to strongly acid channery or flaggy loam; indefinite or weak medium to coarse subangular blocky structure; layer extends into Wisconsin glacial till or frost-worked materials at depths between 4 and 20 feet or more; average depth is about 6 feet.

The permeability of the soil to water is rapid to moderately rapid.

Use and management.—This soil is well suited to all crops of the county, including cane fruits, canning peas, corn, beans, potatoes, oats, barley, wheat, clover and timothy hay, and apples. Lime, nitrogen, and complete fertilizers are needed for good yields.

Cattaraugus channery loam, 12 to 20 percent slopes (Cb; group 5).—Except for having stronger slopes, this soil is similar to Cattaraugus channery loam, 0 to 12 percent slopes. For row crops, the stronger slopes of this soil require contour tillage, stripcropping, or other erosion control. Pastures, orchards, and hay meadows will also benefit from these practices, because they increase the water-holding capacity of the soil.

Cattaraugus channery loam, 20 to 30 percent slopes (Cc; group 11A).—This soil occurs primarily along moderately steep sides of valleys and banks of streams. The soil is similar to Cattaraugus channery loam, 12 to 20 percent slopes, but, because of its steeper slopes, is not so suitable for cultivation. Accelerated erosion is a hazard on the cultivated areas of this soil. Contour tillage, stripcropping, terracing, and long rotations are needed for row crops. The soil is best suited to pasture, orchards, and cane fruits. These crops do well on this sloping soil, especially if the soil is heavily limed and fertilized and the crops are sprayed.

Cattaraugus channery loam, 30 to 40 percent slopes (Cd; group 13B).—This soil occurs on steep sides of valleys; it is extensive in the southern part of the county. Generally the soil is too steep for row crops, but a few acres have been cultivated, mainly to corn and potatoes. Most of this steep soil is used for pasture, is in old orchards, is forested, or lies idle. It is best suited to forest but, if well fertilized and limed, can be used for pasture and orchards.

Cattaraugus stony loam, 0 to 20 percent slopes (Ce; group 12).—The following is a representative profile:

Surface soil—
Stones and boulders 10 to 36 inches in diameter on

surface; frequently surface layer is 2 to 3 inches of loose leaves and twigs, below which is the mineral soil, a succession of 1- to 2-inch layers of friable, very strongly acid stony loam; color of mineral layers is brown, black, or very dark brown to light gray or yellowish red; surface mineral soil up to 6 inches thick.

Subsoil—

Reddish-yellow or strong-brown, strongly acid, friable loam or flaggy loam; weak fine to medium subangular blocky structure; 15 to 24 inches thick.

Substratum—

Red or strong-brown, very strongly acid and strongly acid fine sandy loam that contains much clay or flaggy loam; firm, hard when dry; weak fine subangular blocky structure; extends to depths of 36 inches or more and grades into Wisconsin glacial till (*12*) or flaggy, frost-worked deposits; average depth to bedrock is 6 feet, but range in depth is from 4 to 20 feet or more.

The permeability of the soil to water is rapid to moderately rapid.

Included are some areas of stony Oquaga soils that have depths to bedrock of less than 3 feet.

Use and management.—Most of this soil is wooded. A few acres have been cleared and pastured, but the rocks remain on the surface. Before the area was settled, the forest was white pine and mixed hardwoods, but now it is mostly beech, birch, maple, and some ash and oak. This soil could be successfully cleared and cultivated. When heavily limed and fertilized, it is well suited to almost all crops of the area, including garden peas and alfalfa. Management practices and yields are about the same as for the Cattaraugus channery loams of similar slopes.

Cattaraugus stony loam, 20 to 30 percent slopes (Cf; group 13A).—This soil is similar to Cattaraugus stony loam, 0 to 20 percent slopes, but it occupies steeper slopes on the sides of valleys in the central and southern parts of the county. Except for a few acres in pasture and orchards, the soil is wooded. The soil is well suited to apples, cane fruits, and pasture, but it is generally too steep for cultivated crops. When lime, phosphorus, and other fertilizers are applied, very good pastures can be developed.

Cattaraugus and Lackawanna channery loams, 40 to 60 percent slopes (Cg; group 14B).—These soils were not separately mapped because they occur together on very steep sides of valleys. The reddish parent material is dominantly of the Catskill formation. Except for their steep slopes, these two soils are similar to the channery loams of their respective series. Included are areas of flaggy loam and a few stony spots.

At the time of this survey, none of this mapping unit was cultivated. Some cleared areas were used for pasture, and others were idle or occupied by old orchards. The soils are too steep for cultivation and are best suited to forest.

Cattaraugus and Lackawanna stony loams, 30 to 60 percent slopes (Ch; group 14A).—These two soils are not separated on the map because they are very similar. They are strongly or very strongly acid, reddish-brown or red, deep, well-drained, stony soils of the uplands. They were derived from firm to moderately loose glacial till and frost-worked materials of the Wisconsin age.

The soils mainly occur on the very steep sides of valleys where normally the deposits are thick. They are similar to the channery loams of their respective series, but the sandstone fragments both within and on the surface of these stony soils are much larger and more plentiful. The stones are larger than 15 inches along the longest axis and are too numerous to be economically removed. The soils occur together in the same areas; they are associated with the same soils as when they occur separately. They were mapped together in those areas much too steep for cultivation.

Cavode Series

The somewhat poorly drained, shallow Cavode soils of the uplands occur on residuum derived from interbedded gray and yellow shale and siltstone of the Pocono formation. They also occur on sticky and plastic, frost-worked materials that contain many fragments of shale and sandstone.

Areas of the Cavode soils are small. They are mainly in the south-central and southwestern parts of the county on the high parts of the Allegheny Plateau. The soils primarily occur in association with well-drained Wharton and very poorly drained Chippewa soils on residuum. They are also associated with well-drained Wharton and very poorly drained Brinkerton and Armagh soils on frost-worked deposits. Cavode soils are similar to Brinkerton and Armagh silt loams, but they are more shallow and contain more shale fragments in the parent materials.

Cavode channery silt loam, 0 to 8 percent slopes (Ck; group 8A).—The following is a representative profile:

Surface soil—

Very dark gray, extremely acid, friable silt loam of weak fine granular structure; 2 to 3 inches thick; silt loam grades into brownish-yellow, friable, very strongly acid channery silt loam of weak medium to fine granular structure; total depth of surface soil is 10 to 12 inches; many small fragments of siltstone, sandstone, and shale of Pocono formation throughout.

Subsoil—

Mottled yellow and gray, very firm but brittle, very strongly acid channery silty clay loam; moderately strong medium subangular blocky structure; layer extends to depth of about 22 inches.

Substratum—

Mottled gray, pale-brown, and yellow, very strongly acid clay loam; extremely firm when moist, plastic or sticky when wet; strong coarse subangular blocky structure; has many subangular flagstones and channers of shale, sandstone, and siltstone in lower part; layer may extend to depth of 42 inches, where it overlies interbedded dark-brown shale and greenish-gray siltstone of the Pocono formation.

The permeability of the soil to water is slow.

Use and management.—This fine-textured soil tends to be wet most of the time. It is best suited to pasture or forest, particularly such softwoods as hemlock and larch. If it is used for crops, a drainage system that protects the soil from erosion and disposes of excess seepage is needed. When the soil is adequately drained, small grains and potatoes can be grown. Water-tolerant grasses are best suited to this soil.

Cavode channery silt loam, 8 to 15 percent slopes

(Cm; group 8A).—Except that it is more sloping, this soil is similar to Cavode channery silt loam, 0 to 8 percent slopes. Because runoff is more rapid, the soil is better suited to small grains than the more level soil. Diversion terraces and other drainage structures are needed if this soil is used for crops. The soil is entirely too wet for such crops as apples, peas, and beans. It is best suited to growing hemlock, larch, and spruce for pulpwood.

Cavode channery silt loam, 15 to 25 percent slopes (Cn; group 10A).—This soil occurs in only a few places, mainly as narrow bands along streams and as benches on the sides of valleys. Almost all of it is wooded, and if cleared would be suited only to pasture and some cane fruits.

Included are areas of Cavode channery silt loam with 25 to 35 percent slopes. These areas are mostly in the southern parts of the county and near Denton Hill. They are actually complexes of the moderately well drained Mardin and the somewhat poorly drained Cavode soils. Frequent springs keep this inclusion moderately wet throughout the year. Some small spots are flaggy.

Cavode silt loam, 0 to 8 percent slopes (Co; group 8A).—The following is a representative profile:

Surface soil—
Very dark brown or dark grayish-brown, strongly acid, friable silt loam; strong fine granular structure; layer may be 2 to 3 inches thick and is transitional to yellowish-brown, firm, very strongly acid silt loam; when displaced, silt loam is weak coarse granular; surface soil is 10 to 12 inches thick.

Subsoil—
Brownish-yellow, mottled with gray and yellow, sticky and plastic, very strongly acid silty clay; extremely difficult to displace but when displaced forms huge clods that are hard when dry; layer extends to depth of about 20 inches.

Substratum—
Mottled gray, yellow, and brown, very strongly acid, very sticky or plastic silty clay that contains many shale fragments; at depths of 30 inches or more a gradual transition from silty clay to weathered gray, yellow, and brown laminated shale; substratum may have reddish streaks; average depth to bedrock about 2½ feet, but depths range from 1 to 4 feet.

The permeability of the soil to water is slow.

Use and management.—Cavode silt loam, 0 to 8 percent slopes, is one of the stickiest and most plastic soils in the county. It is extremely difficult to cultivate and becomes cloddy if plowed when wet. It is not suited to row crops or to apple trees and is only fair for small grains and hay. If special varieties such as birdsfoot trefoil are used, the soil will produce good pasture and some hay. The soil is best used for forest. If it must be cleared, pasture, hay, and small grains can be produced. Yields of pasture are best, and, in the order listed, yields are progressively less satisfactory for the other crops. Diversion terraces and other structures to remove excess water are necessary to keep the soil dry enough to work. Heavy applications of lime, nitrogen, and complete fertilizer are needed for good yields.

Cavode silt loam, 8 to 15 percent slopes (Cp; group 8A).—This soil is similar to Cavode silt loam, 0 to 8 percent slopes, but because of stronger slopes, external drainage is greater. The soil occurs most frequently on long gentle slopes around the headwaters of streams that dissect the Allegheny Plateau. It occurs in only a few places in the county, mainly on Denton Hill near Camp Potato, and in isolated spots near Crystal and in the southwestern part near the Clinton-Potter county line.

The soil is not generally cleared, and it supports good stands of hemlock, birch, and maple. A few cleared areas are used for pasture, and a few acres in fields with better soils may be cultivated. Like the more level Cavode silt loam, this soil is suited to hay, grain, and pasture. It is not suited to orchard fruits, potatoes, corn, and other row crops. The cultivated areas of this soil are erodible, and contour tillage, drainage terraces, and diversion terraces are needed to check erosion.

Cavode silt loam, 15 to 25 percent slopes (Cr; group 10A).—This soil occurs in the Allegheny Plateau on the upper slopes of sides of valleys and around the heads of streams. Because it is more strongly sloping than the two less strongly sloping Cavode silt loams, externally it is better drained; but it is similar to these soils in most other respects. Despite the better external drainage, Cavode silt loam, 15 to 25 percent slopes, is sticky and plastic when moist and very tough and hard when dry.

The soil is not suited to row crops. When it is properly fertilized and limed, pastures, hay, or grain grow well. Suggested amendments are the same as for the more nearly level Cavode silt loams. This soil, however, is best used for forest and, in a few places, for pasture.

Cavode stony silt loam, 0 to 15 percent slopes (Cs; group 10B).—The following is a representative profile:

Surface soil—
Some areas covered with 3 to 4 inches of well-rotted leaf mold; fragments of shale and siltstone on surface; mineral soil a succession of 2- to 3-inch friable layers that are transitional in color from very dark gray or black to pale gray, and, in turn, to dark brown; strong medium to fine granular structure; texture generally silt loam, with many large fragments of shale and siltstone; entire depth may be 8 to 9 inches.

Subsoil—
Mottled brownish-yellow and gray, very strongly acid, very sticky or plastic shaly silty clay that forms huge clods when displaced; layer extends to depth of about 20 inches.

Substratum—
Mottled yellow and gray, sticky and plastic, very strongly acid laminated shaly silty clay that contains many small shale fragments; silty clay extends to depth of about 24 inches and overlies interbedded gray and brown shale and siltstone of the Pocono formation; average depth to bedrock about 2 feet but depths range from 0.5 to 3 feet.

The permeability of the soil to water is slow.

Use and management.—Almost all of this soil has good stands of hemlock, birch, and maple. A few scattered acres in the southern part are cleared, but the soil is best suited to forest.

Cavode stony silt loam, 15 to 50 percent slopes (Ct; group 14A).—Except for its stronger slopes, this soil is similar to Cavode stony silt loam, 0 to 15 percent slopes. It occurs along the upper parts of the valley

walls and around the headwater basins of streams that flow through the Allegheny Plateau. This sloping soil has very rapid runoff and if cultivated would readily erode. But only a small part is cleared, and most of this is in pasture. The rest of the soil is in softwoods, for which it is well suited.

Chenango Series

The somewhat excessively drained, very deep Chenango soils occur on glacial terraces and stream fans that contain sand, gravel, and cobblestones from many kinds of rocks. Pebbles of granite, gneiss, chert, and quartzite are common, as are pebbles and cobbles of green and gray sandstone and siltstone of the Pocono and Pottsville formations.

The Chenango soils in this county are confined largely to the northern and central parts of the county along Oswayo Creek, the Genesee and Cowanesque Rivers, and the tributaries of these streams. Typical Chenango soils occur near East Sharon on Honeoye Creek. Chenango soils occur in association with the well-drained Unadilla and the moderately well drained Braceville soils on terraces and with the Tioga and Middlebury soils on bottom lands. The Chenango soils also extend into the upland areas where the well-drained Woostern and moderately well drained Mardin soils occur. All of these soils contain many pebbles and cobbles. Most of the Chenango soils are quite loose and sandy, but the Woostern and Mardin soils differ from Chenango soils in that they contain silt and clay from till and are frequently compact and firm in the subsoil.

Chenango gravelly loam, 0 to 12 percent slopes (Cu; group 1).—The following is a representative profile:

Surface soil—
Dark yellowish-brown or dark-brown, strongly acid, very friable gravelly loam; weak coarse granular structure; about 7 inches thick.

Subsoil—
Brownish-yellow, strongly acid, very friable gravelly loam; indefinite structure; layer may extend to depth of 28 inches.

Substratum—
Brownish-yellow, strongly acid, loose or very friable gravelly loamy sand; gradual transition to stratified beds of sand and gravel, each normally less than 2 feet thick; average depth to bedrock about 10 feet, but depths range from 5 to 30 feet or more.

The permeability of the soil to water is very rapid.

Use and management.—This soil is well suited to all crops of the area except apples, but it requires continuous applications of lime, manure, and complete fertilizer for good yields. It is not well suited to apples, because of the low valley relief and consequent frost damage that results from lack of air drainage.

Chenango gravelly loam, 12 to 20 percent slopes (Cv; group 5).—This soil occurs as narrow bands along the escarpments of the glacial terraces. In many respects it is similar to Chenango gravelly loam, 0 to 12 percent slopes, but it includes more cobbly areas where streams or overwash have deposited coarser material. Because of these cobbly areas, only a small acreage is cultivated. A few areas are suited to apples and cane fruits, but these areas may require irrigation for best yields.

Chenango gravelly loam, 20 to 50 percent slopes (Cw; group 11B).—This soil occurs on the steepest parts of the terrace escarpments, where the slopes are generally too abrupt and too short for cultivation. In areas where the terraces rise to more than one level, a few narrow steep slopes that resemble steps may occur. Areas of this soil that are cultivated as parts of benches are fertilized and managed like the less strongly sloping Chenango gravelly loams. Most of this steep soil, however, is wooded or in pasture.

Chippewa Series

The very poorly drained, deep to very deep Chippewa soils of the uplands occur throughout the county on glacial till or frost-worked deposits. They are in low swampy flats on the Allegheny Plateau and in areas between the headwaters of streams. On the top of high hills in the northern part of the county, they fill low basins and old glacial kettle holes or ice-block holes in the glacial till. Chippewa soils occur in association with all the soils of the uplands that developed from deep, yellowish and gray materials from the Pocono and Pottsville formations.

Chippewa silt loam, 0 to 8 percent slopes (Cx; group 8C).—The following is a representative profile:

Surface soil—
Very dark gray or black, strongly acid, friable mixture of decaying humus and silt loam; layer may extend to depths of 10 to 12 inches.

Subsoil—
Intensely mottled dark-gray, gray, and yellow, strongly acid, slightly compact, sticky, massive silty clay; except for minor variations, this layer is uniform to depths of 30 to 40 inches.

Substratum—
Mottled gray and yellow medium acid channery silty clay loam; very sticky and plastic when wet, hard when dry; some areas contain no channers and texture is silty clay; average depth to bedrock is 5 feet, but depths range from 4 to 20 feet or more.

The permeability of the soil to water is very slow, and most areas are wet throughout the year.

Use and management.—Half of this soil is pastured, and about half is forested with stands of hemlock, larch, soft maple, poplar, and some spruce. The soil is not suited to farming and is normally too wet for mowing, seeding, and other pasture-improvement practices. It might be used for Christmas trees but probably should be in natural forest.

Chippewa stony silt loam, 0 to 8 percent slopes (Cy; group 10B).—Except that most areas are practically carpeted with stones, the soil is similar to Chippewa silt loam, 0 to 8 percent slopes. Some of the stones occurred naturally on the soil, and some were dumped on it by farmers who hauled them from better drained parts of the fields. Large areas of this soil include small knolls of the better drained stony soils of the Mardin, Brinkerton, and Armagh series. All of these soils are best suited to forestry.

Clymer Series

The well-drained, moderately deep, extremely to very strongly acid Clymer soils of the uplands occur on residuum derived from interbedded fine- and coarse-grained sandstones of the Pocono formation. These soils are widespread in the southern and central parts of the county. In the northern part they occur in small isolated areas on high elevations of the Allegheny Plateau. Except for being less coarse textured and deeper, the Clymer soils resemble Leetonia and Dekalb soils, which also occur on residuum. But all these soils on residuum are shallower to bedrock than the Bath soils on till and frost-worked deposits.

The Clymer soils occur mainly in association with and on materials similar to those of the moderately well drained Cookport, poorly drained Nolo, and very poorly drained Chippewa soils.

Clymer channery loam, 0 to 12 percent slopes (C2a; group 1).—The following is a representative profile:

Surface soil—
Yellowish-brown, very strongly acid, friable channery loam; weak medium granular structure; layer often 7 to 8 inches thick.

Subsoil—
Yellowish-brown, strongly acid, firm loam with many fine-grained sandstone fragments; moderately strong fine subangular blocky structure that becomes weak medium subangular with depth; subsoil extends to depth of 24 inches or more.

Substratum—
Yellow, very strongly acid, firm channery fine sandy loam that is slightly discolored with pale-brown and dark-brown weathered sandstone fragments; layer grades into interbedded fine- and medium-grained sandstone and siltstone of the Pocono formation; average depth to bedrock about 3 feet, but depths range from 2 to 6 feet.

The permeability of the soil to water is rapid.

Use and management.—Almost all of this somewhat droughty soil is wooded. It has good stands of beech, maple, and oak, and a scattering of white pine. A small acreage is cleared, mostly for potatoes. When heavily limed and fertilized, the soil is suited to oats, barley, buckwheat, snap beans, hay, and pasture. Because most of this soil occurs on ridgetops of the Allegheny Plateau at elevations of about 2,300 feet, the growing season is normally short. Short-season crops therefore should be grown.

Clymer channery loam, 12 to 20 percent slopes (C2b; group 5).—Except that it is more sloping, this soil is similar to Clymer channery loam, 0 to 12 percent slopes. It frequently occurs around the heads of streams and along the sloping crests of ridges. Normally the soil borders steep land and therefore is subject to accelerated erosion when cultivated. Almost all of this soil is wooded, but a few scattered fields are used for potatoes. Contour tillage or stripcropping is necessary to maintain yields. Otherwise, management is the same as for Clymer channery loam, 0 to 12 percent slopes.

Clymer channery loam, 20 to 30 percent slopes (C2c; group 11A).—Except for its moderately steep slopes, this soil is similar to Clymer channery loam, 12 to 20 percent slopes. It occurs in the southern and west-central parts of the county on the steep upper sides of valleys. This soil is normally too steep for agriculture. All of it is forested. The stand is mostly beech, birch, and maple, but there is some pine and oak.

Clymer stony loam, 0 to 20 percent slopes (C2d; group 12).—This upland soil occurs on residuum that was derived from interbedded siltstone and sandstone of the Pocono and Pottsville formations. It occurs chiefly as pockets of deeper soil on the benches and gently sloping ridgetops and hillsides in the southern and central parts of the county. In the northern parts the soil occurs as isolated knolls in places where glacial till predominates.

This soil is associated mainly with the very stony soils of the Leetonia and Dekalb series. It is also associated with Clymer channery loam.

This soil is brownish yellow, extremely acid, and stony or flaggy. Generally it is similar to Clymer channery loam, but it has many sandstone fragments on the surface.

Most of this soil is forested, but some small cleared areas are used for orchards, and some that farmers use for dumping rock are pastured. The forests contain red and white pines, oak, beech, and maple. Some areas could be made arable if they were cleared, heavily limed, and fertilized.

Clymer stony loam, 20 to 30 percent slopes (C2e; group 13A).—Except that it is more strongly sloping, this soil resembles Clymer stony loam, 12 to 20 percent slopes. In profile Clymer stony loam, 20 to 30 percent slopes, is similar to Clymer channery loam, 0 to 12 percent slopes.

This stony soil may be used for hay or cane fruits, but it is generally too steep for cultivation. Furthermore, it is normally too acid, stony, and droughty for good pasture. Areas that are cleared for crops need heavy applications of lime, complete fertilizer, and manure for good yields. But almost all of this soil is wooded and has good stands of mixed northern hardwoods. The soil is best suited to and should remain in forest.

Cookport Series

The moderately well drained, moderately deep Cookport soils of the uplands occur on residuum that was derived from interbedded gray and brown sandstone and siltstone of the Pocono formation. These soils occur in close association with, and on parent material similar to that of, the well-drained Dekalb and Clymer soils and the poorly drained Nolo soils. Like the Dekalb, Clymer, and Nolo soils, the Cookport are at high elevations along the sides of valleys of the Allegheny Plateau. They are most prevalent in the southern and central parts of the county around the headwaters of streams and on gently sloping divides.

Cookport channery loam, 0 to 8 percent slopes (C2f; group 3).—The following is a representative profile:

Surface soil—
Dark-brown, very strongly acid, very friable channery loam; weak fine granular structure; layer grades into yellowish-brown friable to firm channery loam of moderately strong medium granular structure; surface soil may be from 5 to 12 inches thick.

Subsoil—

Brownish-yellow fine sandy loam or loam, slightly mottled with brown and gray; very strongly acid; friable to firm; strong medium subangular blocky structure; layer extends to depths of 30 to 40 inches, where a weathered interbedded fine- and coarse-grained ledge of gray and brown sandstone occurs; average depth to bedrock 3 feet, but depths may range from 2 to 6 feet or more.

The permeability of the soil to water is moderate to moderately rapid.

Use and management.—This soil is best suited to forest. It has good stands of beech, maple, oak, ash, and some pine and hemlock. Before the area was settled, the forests were mainly pine and hemlock. A few areas are cleared and in pasture or used for oats, buckwheat, red and black raspberries, and blueberries. If diversion terraces or other suitable drainage is provided, potatoes and snap beans can be grown, but heavy applications of lime, manure, and complete fertilizer are needed for good yields.

Cookport channery loam, 8 to 15 percent slopes (C2g; group 6).—This soil occurs mainly around the sloping basinlike heads of streams that dissect the Allegheny Plateau. Because the soil is more sloping, it has more rapid runoff than Cookport channery loam, 0 to 8 percent slopes. It therefore can be used without additional drainage for small grains and potatoes. Suggested liming, fertilization, and management are similar to those on Cookport channery loam, 0 to 8 percent slopes.

Cookport channery loam, 15 to 25 percent slopes (C2h; group 11A).—Because of its moderately steep slopes, cultivation of this soil must include contour tillage or stripcropping for erosion control. But most of the soil is wooded, and a few scattered acres in the southwestern part of the county are pastured. If cultivated, the soil requires about the same management as Cookport channery loam, 0 to 8 percent slopes. Yields on the two soils will be about the same. Some areas of this moderately steep channery soil may be suited to raspberries.

Cookport stony loam, 0 to 15 percent slopes (C2k; group 12).—The following is a representative profile:

Surface soil—

Mat of forest debris about 3 inches thick on surface; mat overlies 2 inches of very dark gray or black, very friable loam of weak medium granular structure that, in turn, overlies 1 to 2 inches of light-gray loose loam; combined layers 6 to 7 inches thick; all are extremely to strongly acid.

Subsoil—

Brownish-yellow to yellow silty clay loam or fine sandy clay faintly mottled with grayish brown; very strongly acid; firm and brittle; strong medium subangular blocky structure; may contain many channers of sandstone and siltstone; as much as 25 inches deep.

Substratum—

Mottled yellow and gray, extremely acid, firm fine sandy clay that grades into yellow weathered sandstone and siltstone; average depth to bedrock about 36 inches, but depths range from 2 to 5 feet or more.

The permeability of the soil to water is moderate.

Some areas of soil that normally would be placed in the finer textured Cavode series are mapped with Cookport stony loam because of the coarse sandstone fragments on the surface.

Use and management.—Almost all of this soil has good stands of mixed northern hardwoods and softwoods. The principal trees are beech, maple, white pine, and hemlock; there are some oaks and poplars. A few areas could be cleared for pastures or used for berries, mainly blackberries and blueberries.

Cookport stony loam, 15 to 25 percent slopes (C2m; group 13A).—This soil occurs on the gently sloping interstream areas and in basins around the heads of streams that dissect the Allegheny Plateau. Except for its stronger slopes, the soil is similar to Cookport stony loam, 0 to 15 percent slopes.

Most of the soil is wooded. If it were cultivated, it would require some protection against erosion. Crops suited to this soil and fertilizer requirements are similar to those of Cookport channery loam, 15 to 25 percent slopes.

Cookport stony loam, 25 to 50 percent slopes (C2n; group 13A).—This soil occurs on the steepest parts of the upper sides of valleys and on plateau escarpments around the headwaters of the drainage system. The slopes are too steep and the soil too stony for farming. The soil has good stands of mixed northern hardwoods and softwoods. It should remain in forest.

Culvers Series

The moderately well drained, deep to very deep Culvers soils of the uplands occur on Wisconsin glacial till or frost-worked materials. These materials were derived from red, gray, and green sandstone and siltstone. The soils are situated mainly on low sides of valleys, in slight depressions, and on gently sloping interstream areas (fig. 6). Culvers soils occur in asso-

***Figure 6.*—Culvers, Morris, Cattaraugus, and Lackawanna soils near Sweden Valley. In the foreground, Culvers soils are on the left and Morris soils on the right. The Culvers soils extend almost to the cleared field. The Morris soils extend to where the scrub growth is thick. Cattaraugus soils occupy the foot slopes. They extend from the Culvers and Morris soils across the high border of the field and along the top of the foot slopes. Lackawanna soils are above the foot slopes.**

ciation mainly with the following soils: (1) shallow Oquaga; (2) well-drained, deep Cattaraugus; (3) poorly drained Morris, and (4) very poorly drained Norwich.

Culvers channery silt loam, 0 to 8 percent slopes (C2o; group 3).—The following is a representative profile:

Surface soil—
Dark-brown or reddish-brown, very strongly acid, friable channery silt loam; weak medium granular structure; layer normally 4 to 8 inches thick.

Subsoil—
Yellowish-red channery fine sandy clay loam or clay loam, slightly mottled with gray and yellowish brown; very strongly acid; firm to very firm (hard and brittle when dry); structure generally strong medium subangular blocky but may be weak or thick platy in some profiles; layer may extend to a depth of 20 inches or more.

Substratum—
Extremely mottled yellow, brown, and reddish-gray fine sandy clay loam; compact and very hard and brittle when dry; very strongly or strongly acid; weak to moderately strong medium subangular blocky structure; layer may extend to depth of 70 inches, where the soil grades into glacial till or flaggy, frost-worked materials; average depth to bedrock about 6 feet, but depths range from 4 to 20 feet or more.

The permeability of the soil to water is moderate.

Use and management.—More than one-third of this soil is in crops, and almost one-half is wooded. The rest is pastured or idle. Without artificial drainage, the soil is well suited to pasture, hay, and small grains. When drained and given adequate applications of lime, nitrogen, and complete fertilizer, it produces good yields of potatoes, beans, corn, alfalfa, and garden peas. The soil is not suited to apples, because it is inadequately drained and because it lies in areas subject to frost.

Culvers channery silt loam, 8 to 15 percent slopes (C2p; group 6).—Except that it is more sloping, this soil is similar to Culvers channery silt loam, 0 to 8 percent slopes. The soil is better suited to row crops than the less sloping Culvers channery silt loam. This soil is well suited to pasture and hay.

Culvers channery silt loam, 15 to 25 percent slopes (C2r; group 11A).—This soil occurs on sloping to strongly sloping areas around the headwaters of streams that dissect the Allegheny Plateau. Because of the stronger slopes, only a small part of the soil is used for crops. Most of it is pastured or idle and the rest is wooded. The stronger slopes increase external drainage, but seepage from higher elevations normally keeps the soil wet. Diversion terraces therefore are needed if corn, beans, or potatoes are grown. The soil is well suited to pasture and hay.

Culvers channery silt loam, 25 to 35 percent slopes (C2s; group 13B).—This soil occurs mainly on steep foothills and interstream areas between ridges of better drained and higher soils. The soil is generally too steep for cultivation, and only a small part of this soil is cleared. Some of the cleared soil is in pasture, and some is idle or in hay. But most of this soil has good stands of maple, beech, birch, and some oak and hemlock. The original forest consisted primarily of pine and hemlock, mixed with birch, beech, and maple.

Culvers stony silt loam, 0 to 15 percent slopes (C2t; group 12).—The following is a representative profile:

Surface soil—
Dark-brown layer overlies pale brownish-gray layer, each about 3 inches thick; below these lies a reddish-yellow layer that extends to a depth of about 16 inches; all layers very strongly acid friable stony silt loam; medium and fine granular structure.

Subsoil—
Yellowish-red channery silt loam, flaggy silt loam, or loam slightly mottled with gray and yellowish brown; firm; strongly acid; strong fine subangular blocky structure; layer extends to depth of about 26 inches.

Substratum—
Mottled brown and yellow or weak-red flaggy clay loam or silt loam, slightly mottled with brown and red; compact and firm or very firm; strong medium subangular blocky structure; average depth to bedrock about 6 feet, but depths may range from 4 to 20 feet or more.

The permeability of the soil to water is moderate.

In the southern part of the county the substratum grades into flaggy frost-worked materials. In the northern part it grades into stony, reddish Wisconsin glacial till. In some southern areas the structure of the substratum is thick platy.

Use and management.—Almost all of Culvers stony silt loam, 0 to 15 percent slopes, is in forest, mainly beech, birch, maple, and hemlock. Areas that have recently become idle are in brushy pastures, aspen, and scattered trees of other species. About one-eighth of the soils is pastured, and a very small part is in crops. Generally, the pastures are better than those on the associated stony Cattaraugus and Morris soils. Some of this soil could be profitably cleared and made arable. It is best suited to pasture, small grains, and potatoes, but when it is drained, it can also be used for such crops as peas and beans. Suggested liming, fertilization, and other management are similar to those for the Culvers channery silt loams.

Culvers stony silt loam, 15 to 25 percent slopes (C2u; group 13A).—This soil is similar to Culvers stony silt loam, 0 to 15 percent slopes, except that it is more strongly sloping. It is steep enough to have good external drainage, but internally the soil is only moderately well drained. This hilly soil often occurs around the heads of streams and along the sides of valleys in the northeastern and southern parts of the county. Springs and seepage areas are frequent, but the soil is dry most of the crop season.

Some areas of this Culvers stony silt loam are actually part of a complex of Morris and Culvers soils. All of the soil, however, can be drained, cleared, and used for pasture or crops. If the soil is used for crops, the slopes need stripcropping and other measures to control accelerated erosion. Almost all of this soil has good stands of beech, birch, maple, and hemlock.

Culvers stony silt loam, 25 to 35 percent slopes (C2v; group 13A).—This steep soil occurs mostly on the sides of valleys around springs and seepage areas. Almost all of it is in forest; none is cultivated. A small part is used for pasture and some is idle. The best use of this soil is for forest.

Culvers and Wellsboro channery silt loams, 35 to 50 percent slopes (C2w; group 14B).—The soils of this mapping unit are either Culvers channery silt loam,

35 to 50 percent slopes, or Wellsboro channery silt loam, 35 to 50 percent slopes. These soils are mapped together because of their similarity when they occur together on the steep slopes. Neither of these soils is described separately in this soil survey, but less steep Culvers and Wellsboro channery silt loams are.

Culvers and Wellsboro channery silt loams, 35 to 50 percent slopes, are moderately well-drained, deep and very deep, very strongly acid soils of the uplands. They occur on steep and hilly sides of valleys. They have developed mainly from Wisconsin glacial till or frost-worked deposits that were derived from fine-grained sandstone and siltstone of the Catskill formation.

The surface soil of these soils is brown or red, and the reddish subsoil is mottled with yellow or yellow and brown. Because of the steep slopes, these soils have good external drainage, but springs and seepage spots keep the subsoil moist.

Use and management.—Most of these soils should remain in stands of maple, birch, and beech. A small part is cleared, and this is pastured or idle. Because the slopes are much too steep, none of the acreage is in row crops. The less steep slopes could be used for pasture.

Dekalb Series

The well and somewhat excessively drained, very shallow to moderately deep Dekalb soils of the uplands occur on residuum. This residuum was derived from gray sandstone and some interbedded shale of the Pocono and Pottsville formations. Dekalb soils are on the highest parts of the ridges and plateau in the southern and central parts of the county. They are also on isolated knolls in the glaciated northern part. These soils occur in association with and on parent material similar to that of the generally deeper, well-drained Clymer soils, and with the moderately well drained Cookport soils. They are also associated with the poorly drained Nolo, Brinkerton, and Armagh soils, and with the very poorly drained Chippewa soils. The Nolo soils occur on mixed residuum, whereas the Brinkerton and Armagh and Chippewa soils occur on glacial till and frost-worked materials.

Dekalb channery loam, 10 to 25 inches deep, 0 to 12 percent slopes (Da; group 7).—The following is a representative profile:

Surface soil—
Dark-gray or light-gray, extremely acid, friable channery loam; strong medium granular structure; layer may be 4 to 5 inches thick.

Subsoil—
Brownish-yellow, extremely acid, friable or very friable channery loam; little or no structure; layer extends to a depth of about 20 inches.

Substratum—
Weathered gray sandstone and, in places, interbedded shale bedrock of the Pocono formation; average depth to bedrock usually about 1 foot, but bedrock may be on the surface or as deep as 2 feet.

The entire profile may contain partly weathered fragments of sandstone and shale. The permeability of the soil to water is very rapid to rapid.

Use and management.—More than half of this soil is in forest consisting mainly of oak, ash, hickory, and maple trees. The understory frequently has a heavy growth of laurel or rhododendron. Old stumps and shoots of chestnut occur in many places and indicate that this species was important in the area at one time.

The soil is generally too shallow for row crops, but a few acres of deeper soil may be included in the mapping units, and these may be cultivated. The most suitable crops are oats, buckwheat, other small grains, cane fruits, blueberries, and potatoes. Good yields require cover crops, long rotations, and very heavy applications of lime, complete fertilizer, and manure.

Dekalb channery loam, 10 to 25 inches deep, 12 to 20 percent slopes (Db; group 7).—This soil is similar to Dekalb channery loam, 10 to 25 inches deep, 0 to 12 percent slopes, but occurs along the sides of narrow sloping ridges that often have sharp contours. Because the areas are sloping and narrow, contour cultivation is impractical. This soil is best used for forest, pasture, red and black raspberries, and blueberries. If cultivated, the soil requires very heavy applications of lime, complete fertilizer, and manure, as well as cover crops.

Dekalb channery loam, 10 to 25 inches deep, 20 to 30 percent slopes (Dc; group 11D).—This soil occurs on narrow, moderately steep areas in which Pocono sandstone outcrops frequently. This soil is shallow and much too steep for cultivation, but some of the slightly deeper areas can be used for cane fruits or pasture. This soil is best used for forest.

Dekalb channery loam, 40 or more inches deep, 0 to 12 percent slopes (Dd; group 2).—The following is a representative profile:

Surface soil—
Dark-brown or brownish-yellow, extremely acid, friable or very friable channery loam; strong medium granular structure; layer may be as deep as 7 to 8 inches.

Subsoil—
Yellowish-brown, extremely acid to strongly acid, firm but brittle, vesicular channery loam; when soil is displaced, structure is strong irregular coarse granular, but when in place, the structure is not clearly defined; lower part grades into light yellowish-brown, firm, channery loam or flaggy loam; subsoil may extend to depths of 24 to 36 inches.

Substratum—
Yellow very friable channery sandy loam slightly spotted with brown from weathering rock fragments; very strongly acid, very weak thick platy structure; channery sandy loam grades into weathered brown and yellow interbedded sandstone and siltstone of the Pocono formation; average depth to bedrock about 3½ feet, but depths may range from 2 to 5 feet.

The permeability of the soil to water is rapid.

Use and management.—Almost all of this soil is wooded with good stands of oak, birch, and maple and some beech and white pine. But small clearings throughout the county are used for potatoes, small grains, hay, and a few apple trees.

Good yields require very heavy applications of lime, complete fertilizer, and manure. The soil also is improved by green manure. It is not well suited to peas, beans, alfalfa, or corn unless large applications of lime and fertilizer are used. A few of the sandier inclusions may also require irrigation during dry years.

Dekalb channery loam, 40 or more inches deep, 12 to

20 percent slopes (De; group 7).—This soil occurs primarily on the ridge crests and gently sloping sides of valleys. It is similar to the Dekalb channery loam, 40 or more inches deep, 0 to 12 percent slopes, but would require erosion control if cultivated. Most of this soil is forested. If cleared, it would be best suited to cane fruits, pasture, and small grains.

Dekalb channery loam, 40 or more inches deep, 20 to 30 percent slopes (Df; group 11B).—This soil is extensive along the moderately steep sides of valleys of the southern part of the county. Almost all the soil is wooded. If cultivated, it would require complex erosion control practices. The best use of the soil is for forest, but a few clearings are in hay, berries, pasture, and old orchards.

Dekalb channery loam, 40 or more inches deep, 30 to 40 percent slopes (Dg; group 13B).—This soil occurs on the steepest parts of the sides of valleys in the southern part of the county where the deeper Dekalb soils predominate. The slopes are much too steep for cultivated crops. Most of the soil is and should remain wooded.

Dekalb fine sandy loam, 0 to 12 percent slopes (Dh; group 2).—The following is a representative profile:

Surface soil—
Dark-brown or yellowish-brown, extremely acid, loose fine sandy loam; weak fine granular structure; layer may be 6 to 7 inches thick.

Subsoil—
Yellowish-brown, extremely acid, loose and structureless fine sandy loam that in some places may be a sandy loam; upper subsoil extends to a depth of about 34 inches, where it grades into a pale-brown or yellow, extremely acid sandy loam.

Substratum—
Weathered ledges of coarse yellowish-brown or gray sandstone occur at depth of about 42 inches; average depth to bedrock may be 3 feet, and depths range from 2 to 7 feet or more.

The permeability of the soil to water is very rapid.

Use and management.—Only a small part of this soil is cultivated, and the rest is in forest. Forests mainly consist of mixed white pine, oak, hickory, beech, and maple, with a pronounced understory of laurel and rhododendron. The main crops—potatoes, oats, and clover—are grown in rotation.

This extremely acid and somewhat excessively drained soil has only a limited use for crops. Because the soil is droughty, it requires irrigation if used extensively for crops.

Dekalb fine sandy loam, 12 to 20 percent slopes (Dk; group 7).—This soil occurs on the gently sloping valley walls and ridge crests where the Dekalb soils prevail. The soil is similar to and should be managed in the same manner as Dekalb fine sandy loam, 0 to 12 percent slopes. Although the slope of this soil is greater than that of the less sloping Dekalb fine sandy loam, the soil is porous enough to absorb normal rainfall. If this soil were cultivated for crops, accelerated erosion would not be a problem. None of this soil, however, is cultivated, and it should be kept in forests.

Dekalb fine sandy loam, 20 to 30 percent slopes (Dm; group 11B).—This soil occurs on moderately steep sides of valleys. It is almost all wooded. The soil supports good stands of oak, beech, maple, and some pine. If it is necessary to use this soil for crops, blueberries and cane fruits would grow best.

Dekalb stony loam, 10 to 25 inches deep, 0 to 20 percent slopes (Dn; group 12).—This somewhat excessively drained upland soil occurs on residuum derived from coarse- and fine-grained sandstone of the Pocono and Pottsville formations. It occurs primarily in the south-central and western parts of the county on high ridges. It also occurs on that part of the Allegheny Plateau capped by hard sandstone. It is associated mainly with the following soils: (1) Clymer and Cookport on well and moderately well drained residual materials; (2) Nolo and Chippewa on poorly and very poorly drained materials; and (3) other shallow Dekalb soils. Many cobbles and boulders of coarse- and fine-grained sandstone litter the surface of this soil.

Representative profile:

Surface soil—
Covering of twigs, leaves, and humus about 3 inches thick may overlie mineral soil; mineral surface soil has two layers, one a very dark gray loam and the other light-gray loam, each about 1 to 2 inches thick; both layers are very friable, extremely acid, and of weak fine granular structure; mineral soil 3 to 4 inches thick.

Subsoil—
Yellowish-brown, extremely acid, very friable or loose, structureless stony loam or fine sandy loam; layer may extend to depth of 24 inches, but depth normally is about 10 inches.

Substratum—
Bedrock is slightly weathered gray and pale-brown, medium-textured sandstone of the Pocono formation; average depth of soil about 1 foot, but bedrock may be on the surface or as deep as 2 feet.

The permeability of the soil to water is very rapid.

Use and management.—This shallow stony loam is almost all wooded. It has a fair stand consisting of red and white pine, oak, some maple, ash and beech, and a pronounced understory of laurel and rhododendron. Because of the thin surface soil and droughtiness, this soil should be kept in forest.

Dekalb stony loam, 10 to 25 inches deep, 20 to 30 percent slopes (Do; group 13A).—This soil occurs on the sharp contours of the sloping and moderately steep sides of valleys where the Dekalb stony soils predominate. Generally the soil is quite thin, and ledge outcrops are frequent. This soil is generally timbered and, if cleared, would be only suited to crops such as blueberries and black raspberries. The soil is much too thin and sharply sloping for row crops. Its best use is for forest.

Dekalb stony loam, 40 or more inches deep, 0 to 20 percent slopes (Dp; group 12).—This brown stony soil is very strongly acid, moderately deep, and well drained. It occurs in the uplands on frost-worked deposits and residual materials that were derived primarily from brown, gray, and yellow sandstone of the Pocono and Pottsville formations that were medium to coarse textured. The soil is situated primarily along the ridgetops and sloping sides of the valleys in the central, southern, and western parts of the county. It occurs in association with well-drained shallow Dekalb and deep Clymer soils and with moderately well drained Cookport and poorly and very poorly drained Nolo and Chippewa soils. It is also associated with

the brownish Cattaraugus and yellowish Bath soils on frost-worked deposits.

Representative profile:

Surface soil—
Several thin layers of friable loam that range from very dark brown through pale brown to dark brown; all layers very strongly acid and of strong to weak medium irregular granular structure; total depth may be 4 to 6 inches.

Subsoil—
Yellowish-brown, very strongly acid, firm or friable stony loam; weak medium subangular blocky structure in some places and structureless in others; layer may extend to a depth of 32 inches.

Substratum—
Light yellowish-brown, strongly acid mixture of large sandstone fragments and loose sandy loam; layer grades to bedrock at average depth of about 3 feet, but depths range from 2 to 5 feet.

The permeability of the soil to water is rapid.

Use and management.—This soil generally is not suited to cultivation because it is stony. If it must be used, potatoes, oats and other small grains, cane fruits, and blueberries will do best; but the large stones must be removed to make cultivation possible. For good yields heavy applications of lime, complete fertilizer, manure, and green manure are needed. Nearly all of the soil is and should remain in forest. Good stands of birch, black cherry, beech, sugar maple, and oak are common.

Dekalb stony loam, 40 or more inches deep, 20 to 30 percent slopes (Dr; group 13A).—This soil occurs primarily along the moderately steep sides of valleys in the southern and western parts of the county. It generally occurs in association with other stony and steep soils. Nearly all of this soil is and should remain in forest.

Dilldown Series

The well-drained, moderately deep Dilldown soils of the uplands occur on residuum derived from coarse- and fine-grained reddish sandstone of the Catskill and Mauch Chunk formations. They are mainly on the high ridges in the southern part of the county. In these areas they are associated with the somewhat excessively drained Leetonia and Dekalb soils that were derived from gray sandstones. In other parts of the county the Dilldown soils are associated with well-drained Lackawanna, moderately well drained Wellsboro, and poorly drained Morris soils. The reddish sandy loams of the Dilldown series contain thick well developed white or gray leached layers. These soils are called red Podzols and in Potter County occur in only a few places.

Dilldown sandy loam, 0 to 12 percent slopes (Ds; group 2).—The following is a representative profile:

Surface soil—
Dark reddish-gray and light reddish-brown layers of extremely acid loose sandy loams; very little structure; layers may be from 4 to 6 inches thick.

Subsoil—
Dark reddish-brown, extremely acid, loose and structureless sandy loam; layer may extend to depths of 16 to 20 inches.

Substratum—
Dusky red, very strongly acid, firm but brittle channery sandy loam; moderately strong medium subangular blocky structure; channery sandy loam grades into weathered red sandstone at average depth of 3 feet; depths to bedrock may range from 2 to 6 feet.

The permeability of the soil to water is rapid.

Use and management.—About half of this soil is wooded with sparse stands of maple, birch, black cherry, and beech. Almost one-fifth is cultivated, and the rest is idle or in pasture. The soil is well suited to potatoes, corn, small grains, and hay. It is also well suited to vegetables, including cucumbers and other vine crops.

Because of sandiness and acidity, the soil requires very heavy applications of manure, complete fertilizer, lime, and phosphorus. For good yields of vegetables overhead irrigation is also required. The best use of this soil is probably forestry, but some special crops that require moderately coarse soils would do well. Because the loose sandy soil readily absorbs rainfall, accelerated erosion is not a problem.

Dilldown sandy loam, 12 to 30 percent slopes (Dt; group 7).—This soil occurs on the sloping ridge crests and valley walls where the Dilldown soils prevail. The soil is similar to Dilldown sandy loam, 0 to 12 percent slopes, but it has better air drainage and is better suited to apples than the less sloping soil. More of this soil is wooded, and only a small part is cropped. The soil is well suited to berries and vine crops. It is low in fertility and for good yields requires heavy applications of lime, manure, and fertilizer.

Germania Series

The well-drained, very deep Germania soils occur on glaciofluvial terraces and stream fans that are primarily old alluvial and colluvial deposits. They are located primarily in the valleys of Kettle and Sinnemahoning Creeks. The Germania soils occur in association mainly with the well-drained Cattaraugus and Lackawanna soils on the uplands and with the Barbour and Vrooman soils on the bottom lands and stream terraces. They are also associated with the moderately well drained Braceville and Wellsboro soils on the more level parts of the terraces and uplands.

The deeply weathered, soft, yellowish-red, or rubified, pebbles and cobblestones of the Germania soils have much the same color as the coarser fragments in the Sweden subsoils. The Germania fan deposits resemble those of the Tunkhannock soils in the northern part of the county, but they are softer, more weathered, and more yellowish red. The Germania fans or terraces contain silt and clay layers and lack the pebbles or cobbles of granite, gneiss, or quartzite that are common in the Tunkhannock deposits.

Germania silt loam, 0 to 12 percent slopes (Ga; group 1).—The following is a representative profile:

Surface soil—
Brown or reddish-brown, strongly acid, very friable silt loam; weak fine granular structure; red and gray or green cobbles and pebbles of sandstone throughout layer but not numerous enough to classify layer as gravelly silt loam; layer about 7 inches thick.

Subsoil—
Reddish-brown to yellowish-red, strongly acid, moderately firm to firm silt loam; weak to moderately strong medium subangular blocky structure; some reddish soft, and well weathered gravel scattered through layer; subsoil extends to depths of 24 to 30 inches.
Substratum—
Yellowish-red to red, medium acid, very firm clay loam; moderately strong medium subangular blocky structure; average depth to bedrock about 8 feet, but depths range from 5 to 30 feet or more.

The permeability to water is moderately rapid.

In many places gravel and cobble layers underlie the clay loam subsoil. These layers have the characteristic yellowish-red color of the Germania and Sweden soils.

Use and management.—About two-thirds of this soil has been cleared but is now idle or in old orchards, crops, or pasture. The rest is in forest, largely beech, red and sugar maples, and red oak. The soil is suited to all crops commonly grown in the county and is very well suited to potatoes, corn, peas, beans, oats, apples, and clover-and-timothy hay.

This soil is not so acid as most soils in the southern part of the county, and good crop response requires only moderately heavy applications of lime. The soil is naturally more fertile than the associated Cattaraugus and Lackawanna soils of the uplands. Consequently, this Germania soil requires lighter applications of complete fertilizer than these soils, but application of manure and the use of cover crops probably should be about the same.

Germania silt loam, 12 to 20 percent slopes (Gb; group 5).—Except for being more erosive because it is more sloping, this soil is similar to Germania silt loam, 0 to 12 percent slopes. If it is cultivated, special practices are needed to preserve the topsoil. These practices are stripcropping, contour tillage, terracing, and use of 3- to 4-year crop rotations that include 1 or 2 years of hay.

Germania silt loam, 20 to 30 percent slopes (Gc; group 11A).—This soil is similar to the less sloping Germania silt loams, except in places where erosion has removed the surface layer and exposed the redder underlying subsoil. Because the soil is highly erosive, cultivation will require erosion control measures such as stripcropping, contour tillage, long rotations, cover crops, and terracing. It is therefore better to use this soil for pastures, orchards, grapes, or cane fruits.

Germania silt loam, 30 to 50 percent slopes (Gd; group 13B).—This steep soil occurs primarily along the banks of the stream valleys and is generally used for pasture or forest. The slope is too steep and the soil too erosive for row crops. In profile, however, this soil is similar to the less sloping Germania silt loams.

Holly Series

The poorly and somewhat poorly drained, deep Holly soils are on bottom lands. Their parent materials are moderately coarse and fine textured, stream-worked sand and silt that contain some gravel. The Holly soils occur on almost all the stream bottoms that are wet, particularly next to the uplands on those bottoms that have frequent seepage basins. They occur in close association with other soils on bottom-land locations—the well-drained Tioga, the moderately well drained Middlebury, and the very poorly drained Papakating.

Holly sandy loam, 0 to 3 percent slopes (Ha; group 9).—This soil occurs mainly near old stream levees. It may contain pronounced beds of gravel.

Representative profile:

Surface soil—
Dark grayish-brown, strongly acid, very friable fine sandy loam or sandy loam; very weak fine granular structure; some areas contain gravel; layer may be 4 to 8 inches thick and grades abruptly into subsoil.
Subsoil—
Mottled gray, brown, and yellow loose or very friable, strongly acid sandy loam; reddish brown streaks in some places; no noticeable structure; pebbles numerous in some places; layer extends to depths of 10 to 25 inches.
Substratum—
Mottled gray and yellow and, in some places, brown, gravelly sandy loam or sandy gravel; average depth to hard material is about 4 feet, but depths range from 3 to 8 feet or more.

The permeability of the soil to water is very slow.

Use and management.—Most of this soil is wooded. A very small part is planted to oats, and the rest is in pasture or idle. The soil is best suited to pasture. If lime and topdressings of phosphorus and nitrogen are applied, pasture maintains a good carrying capacity.

Holly silt loam, 0 to 3 percent slopes (Hb; group 9).—This soil occupies old swales, oxbows, and low depressions on wide stream bottoms. It occurs in association with the very poorly drained Papakating soil more frequently than with the better drained Middlebury and Tioga soils. Like Papakating silt loam, Holly silt loam is periodically overflowed, but unlike the Papakating, its surface soil is grayer and there is no mucky covering.

Representative profile:

Surface soil—
Dark-gray, very strongly acid, very friable or slightly sticky silt loam; strong medium irregular granular structure; layer may be about 4 inches thick.
Subsoil—
Mottled light-gray, brown, and yellow, strongly acid, friable or moderately sticky silt loam; indefinite structure; layer may extend to depths of 10 to 25 inches.
Substratum—
Mottled gray and brown, strongly acid mixed alluvium composed of silty clay, sandy clay, and, in many places, sand and gravel.

The permeability of this soil to water is slow.

Use and management.—Most of this soil is in brushy growth, is pastured, or is wooded. Normally the trees are soft maple, elm, sycamore, willow, and birch. Water-tolerant plants are common. Because it is frequently flooded, the soil is not suited to row crops.

Lackawanna Series

The well-drained, moderately deep to very deep Lackawanna soils occur on the uplands. Their parent materials are channery or flaggy glacial till and frost-worked deposits. These materials were derived from reddish and greenish sandstones and some shales of

the Catskill formation. Lackawanna soils are located mainly in the north-central and northeastern parts of the county, where they are on glacial till. They are on frost-worked deposits or residuum elsewhere in the county. Most of the deposits are generally slightly lower than the surrounding heights of the Allegheny Plateau.

Lackawanna soils occur in association with and are developed from parent material similar to that of the following soils: (1) Moderately well drained Wellsboro; (2) poorly drained Morris; (3) shallow-to-bedrock Oquaga; and (4) very poorly drained Norwich. The Lackawanna soils are similar to the Cattaraugus; they differ chiefly in having redder colors and firmer subsoils.

Lackawanna channery loam, 0 to 12 percent slopes (La; group 1).—The following is a representative profile:

Surface soil—
Dark-red, strongly acid, friable channery loam; strong medium granular structure; layer normally about 6 inches thick.
Subsoil—
Red to purplish-red, strongly acid, moderately firm channery loam; moderately strong medium subangular blocky structure; layer may extend to a depth of 28 inches.
Substratum—
Purplish-red, strongly acid, moderately compact, firm flaggy loam; flaggy loam grades into flaggy, loosely packed glacial till that contains many fragments of red sandstone and shale; average depth to bedrock about 6 feet, but depths may range from 4 to 20 feet or more.

The permeability of the soil to water is moderately rapid.

Use and management.—Almost half of this soil is in crops, and more than one-fourth is wooded with good stands of oak, black cherry, maple, and ash. Many hickory stumps occur. The soil is well suited to almost all the crops of the area, particularly potatoes, oats, corn, peas, beans, apples, clover, and clover-and-timothy hay. With very heavy applications of lime, yields are good, especially for peas and alfalfa. The soil is deficient in natural plant nutrients, but it responds well to heavy applications of complete fertilizer and to side dressings of nitrogen and phosphorus. Green-manure crops or cover crops plowed under also help make the soil productive. The soil could be profitably cleared and cultivated.

Lackawanna channery loam, 12 to 20 percent slopes (Lb; group 5).—This soil occurs mainly on gently sloping ridge crests and on lower valley slopes. It is subject to some erosion and normally requires contour cultivation, stripcropping, or rotations that include 1 or 2 years of grass. In other respects, the soil is similar to Lackawanna channery loam, 0 to 12 percent slopes.

Lackawanna channery loam, 20 to 30 percent slopes (Lc; group 11A).—This soil occurs mainly on the moderately steep sides of valleys. Generally it is not planted to row crops. It is used for small grains grown in rotation with pasture and hay, or for berries and apples. The soil requires heavy applications of fertilizer and lime. More of this moderately steep soil than of the less sloping Lackawanna channery loam is wooded. But this is a good soil to clear for pasture, cane fruits, or apples. It is not a good soil for row crops, because of the risk of accelerated erosion.

Lackawanna channery loam, 30 to 40 percent slopes (Ld; group 13B).—This soil occurs along the steep valley walls like those near Louck's Mills and along the larger streams in the northeast-central part of the county. About half is cleared and used primarily for pastures or lies idle. The soil is well suited to pasture and hay and can produce cane fruits and other berries. Many old orchards are on this soil, but it is much too steep for row crops.

Lackawanna channery silt loam, 0 to 12 percent slopes (Le; group 1).—This well-drained soil of the uplands is on thick frost-worked deposits that resemble glacial till. It is similar to the Lackawanna channery loam, 0 to 12 percent slopes, but it contains many fragments of red and brown sandstone.

Representative profile:

Surface soil—
Weak-red, very strongly acid, very friable silt loam; strong fine granular structure; layer may be as deep as 9 inches.
Subsoil—
Reddish-brown to weak-red, very strongly acid, slightly compact channery silt loam; moderately strong medium subangular blocky structure; layer as much as 24 inches deep.
Substratum—
Weak-red to dusky-red, strongly acid, hard and compact channery clay loam; strong medium subangular blocky structure; layer may extend to a depth of 58 inches and grade into a dark-red mixture of reddish and greenish fine-grained sandstone and siltstone from the Catskill formation; in some places mixture is quite flaggy; average depth to bedrock about 6 feet, but depths may range from 4 to 20 feet or more.

The permeability of the soil to water is moderately rapid.

Use and management.—About one-third of this soil is cultivated, one-third is wooded, and the rest is in pasture or idle. The principal crops are potatoes, wheat, corn, oats, barley, and clover-and-timothy hay. The wooded areas have good stands of white and red oaks, beech, black cherry, maple, and some white pine. A few yellow birch and poplar trees are starting to grow on old fields. The soil is well suited to almost all the crops of the area, but it must be heavily limed and fertilized for good yields. Clover-and-timothy hay, particularly, needs much lime.

Lackawanna channery silt loam, 12 to 20 percent slopes (Lf; group 5).—Except that it is more sloping, this soil is similar to Lackawanna channery loam, 0 to 12 percent slopes. It occurs mainly along the ridge crests and sloping bases of hills (fig. 7). If this soil is cultivated, erosion is a greater risk than on the less sloping Lackawanna channery silt loam. Contour tillage and stripcropping are commonly practiced. Heavy applications of lime and fertilizer are needed for good yields. A large part of this sloping soil is still wooded.

Lackawanna channery silt loam, 20 to 30 percent slopes (Lg; group 11A).—This soil occurs largely along the moderately steep valley walls in the southern and

Figure 7.—**Lackawanna and Tunkhannock soils near Coudersport on stream-fan and frost-worked materials. In the background, Lackawanna channery silt loam, 12 to 20 percent slopes, and Lackawanna channery silt loam, 20 to 30 percent slopes. In the foreground, Tunkhannock gravelly loam, 0 to 12 percent slopes.**

south-central parts of the county, along the tributaries of Kettle and Sinnemahoning Creeks. The soil is often flaggy and normally occurs in association with soils that are stony and more strongly sloping. Little of it is cleared, and that cleared is mostly in pasture or idle. This moderately steep soil supports good stands of oak, beech, maple, and white pine. It should be kept in forest.

Lackawanna channery silt loam, 30 to 40 percent slopes (Lh; group 13B).—This soil occurs on the steep valley walls that appear prominently near Cross Fork. Most of it is and should be kept in forest. The slopes are entirely too steep for row crops and, if cleared, could be used only for pastures, berries, or apples.

Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 0 to 12 percent slopes (Lk; group 1).—This soil has been classified as a moderately deep, residual variant of the Lackawanna soils because, in color and many other characteristics, it resembles the Lackawanna silt loams that occur on frost-worked materials. But this soil is not so deep as the rest of the Lackawanna soils, and it normally occurs on higher elevations. Furthermore, the soil has been more thoroughly leached and podzolized than the Lackawanna soils in the northern part of the county.

This well-drained upland soil is on residuum that was derived from red and green, fine-grained sandstone and siltstone of the Catskill formation. The sandstone and siltstone may include some red shale. In the southern and western parts of the county, the soil occurs on top of and along the sides of the higher ridges in places where the reddish Lackawanna soils prevail. It frequently occurs in association with the shallow-to-bedrock Oquaga soils and, as mapped, may include small areas of them.

Representative profile:

Surface soil—
Dusky-red, extremely acid, very friable channery silt loam; weak medium granular structure; layer may be 6 inches thick.

Subsoil—
Reddish-brown, very strongly or extremely acid, friable channery loam of weak fine subangular structure; channery loam grades into weak-red, firm channery silt loam of strong medium subangular blocky structure; subsoil may extend to a depth of 20 inches.

Substratum—
Dark-red, very firm, strongly acid channery silt or silty clay loam with many tiny fragments of reddish shale or siltstone; strong thick platy structure; layer grades at depths of 3 to 4 feet into red or reddish-yellow bedrock that weathered from greenish and reddish siltstones and fine-grained sandstone of the Catskill formation; average depth to bedrock 3 feet, but depths may range from 2 to 4 feet.

Use and management.—Almost all of this residual variant of Lackawanna channery silt loam has good stands of beech and sugar maple and some white pine and oak. The main crops are potatoes, oats, corn, and clover-and-timothy hay. If sufficiently limed and fertilized, the soil is also suited to other small grains, peas, and pasture. Long rotations, cover crops, and green-manure crops are needed to control erosion on this strongly sloping soil.

Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 12 to 20 percent slopes (Lm; group 5).—This soil is similar to the less sloping residual variant of Lackawanna channery silt loam, 25 to 40 inches deep, except that it is more sloping and probably has a slightly thinner surface soil more frequently broken by outcropping ledges. Generally the two soils have about the same use and fertility. Most of this steeper soil is wooded; only small parts are cultivated, pastured, or idle. Good stands of beech, sugar maple, and some oak and white pine occur. If this sloping soil is cultivated, diversion terraces and contour tillage should always be included in the farm plan.

Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 20 to 30 percent slopes (Ln; group 11A).—This soil occurs on steep valley walls and ridges. It is normally too steep for cultivation, but if cleared is suited to permanent pastures and berries. The few acres cultivated require contour tillage and other measures to prevent loss of the surface soil. Long rotations, green-manure crops, and cover crops should be used continuously. Almost all of this soil is in forest, for which it is best suited.

Lackawanna stony loam, 0 to 20 percent slopes (Lo; group 12).—This deep soil occurs in a few areas in the north-central and northeastern parts of the county. It is mainly in the southern and central parts, however, and in those areas it is more stony and flaggy than in the northern part. Most of the flagstones are red and green, fine-grained sandstone and siltstone of the Catskill formation. They are 6 to 15 inches or more in length. The stones and boulders in the northern parts of the county are rounded and include granite, gneiss, and similar erratics from glacial till.

Representative profile:

Surface soil—
Layer of forest litter or humus about 3 inches thick overlies three successive mineral layers, each 2 to 3 inches thick; mineral layers are (1) very dark brown or black friable loam of strong medium or coarse granular structure; (2) pinkish-gray somewhat loose silt loam that is structureless or of fine granular structure; (3) red moderately firm loam of strong medium or coarse granular structure; all layers are strongly or very strongly acid; depth of combined layers, including the forest litter, is about 9 inches.

Subsoil—
Weak-red or red to purplish-red, strongly acid, friable channery or flaggy loam; moderately strong medium subangular structure; layer extends to depth of 28 inches.
Substratum—
Purplish-red or red, strongly acid, firm channery or flaggy loam; moderately strong medium subangular blocky structure; layer grades into moderately compact and firm flaggy loam or glacial till derived from red or green sandstone and siltstone that contain some erratics; average depth to bedrock 6 feet, but depths range from 4 to 20 feet or more.

The permeability of the soil to water is moderately rapid.

Use and management.—Practically all of this soil is covered by good stands of maple, beech, hickory, and some birch, white pine, and hemlock. There are a few pastures and some idle cleared land. The Wildlife Commission has planted a small acreage to corn, buckwheat, and oats for game feed. Much of this soil could be profitably cleared and cultivated.

Lackawanna stony loam, 20 to 30 percent slopes (Lp; group 13A).—This soil is similar to Lackawanna stony loam, 0 to 20 percent slopes, except that its stronger slopes increase the hazard of erosion. Almost all of this soil is in forest; the rest is in pasture or idle. If this moderately steep stony soil is cleared, it is suited to apples, pasture, and cane fruits, but it is generally too strongly sloping for cultivated crops. The areas that are not too steep could be cleared and cultivated along with more nearly level soils. Fertilization and liming should be the same as for the Lackawanna channery loams or the Lackawanna channery silt loams.

Leetonia Series

The excessively drained Leetonia soils of the uplands occur on residuum that was derived from quartz conglomerate and coarse- and medium-grained sandstones of the Pocono and Pottsville formations. These soils are situated mainly on the high ridges in the southern and western parts of the county and on Clara Ridge in the northwestern part. Normally many blocks and huge stones of conglomerate are scattered over the surface.

These soils occur mainly in association with the stony, steep, well-drained Clymer and Dekalb soils. In wooded areas Leetonia, Clymer, and Dekalb soils have pronounced gray leached layers. They are well-developed Podzols. Also associated with the Leetonia are the moderately well drained Cookport, and poorly drained Nolo, and the very poorly drained Chippewa soils.

Leetonia stony loamy sand, 0 to 20 percent slopes (Ls; group 12).—The following is a representative profile:

Surface soil—
Loose litter of leaves and twigs overlies two mineral layers: (1) black, loose, coarse sand of weak coarse granular structure; (2) white, very loose, structureless coarse or medium sand; all layers extremely acid; surface soil may extend to depths of 10 to 12 inches.
Subsoil—
Two pronounced layers: (1) brown, cemented (very hard when dry), structureless loamy sand or coarse sand; (2) dark-brown, weakly cemented (hard and brittle when dry), structureless loamy sand or coarse sand; both layers extremely acid and difficult to displace when dry; at depth of 22 inches, brownish-yellow, loose, structureless, extremely acid coarse sand occurs and continues for 10 inches to weathered coarse sandstone or conglomerate; average depth 3 feet but depths range from 1 to 4 feet.

The permeability of the soil to water is very rapid.

Use and management.—Most of Leetonia stony loamy sand, 0 to 20 percent slopes, is wooded. The soil is too acid and, because of its coarse texture and shallowness, too droughty for crops. The soil is warm, however, and under proper management good yields of potatoes and some vegetables probably could be obtained. Extremely heavy applications of lime, manure, and complete fertilizer, and the use of irrigation and green-manure crops, would be needed. Most areas, however, are so stony and inaccessible that clearing is exceptionally difficult. This soil is best used for forest.

Leetonia stony loamy sand, 20 to 30 percent slopes (Lt; group 13A).—Except that it is more strongly sloping, this soil is similar to Leetonia stony loamy sand, 0 to 20 percent slopes. The soil occupies the crests and upper slopes of the valley walls that lead to steeper soils. Like Leetonia stony loamy sand, 0 to 20 percent slopes, this soil is best suited to forest.

Leetonia channery loamy sand and Dekalb channery loam, 30 to 60 percent slopes (Lr; group 14B).—Steep areas of these soils were mapped as one soil unit. The soils occur on the steepest parts of the deeply entrenched valleys of the southern and western parts of the county. They also occur along ridges. On the sides of the valleys are exposures of coarse sandstone of the Pottsville formation and sandstone and siltstone of the Pocono formation. All of the parent material is residual, and outcrops of bedrock are common. The surface of these soils, however, is not very stony or flaggy, and viewed through the woods, the steep slopes seem smooth.

These soils are extremely acid, excessively and somewhat excessively drained, and shallow.

Use and management.—All areas of these very steep soils have moderately good stands of mixed white pine, hemlock, chestnut oak, maple, and beech. Normally there is a dense understory of laurel and rhododendron.

Leetonia and Dekalb very stony soils, 0 to 20 percent slopes (Lu; group 14A).—These soils are mapped and described together because stoniness is their outstanding characteristic. Some areas of this unit contain mainly coarse conglomerate rock of the Pottsville formation from which the Leetonia soils are derived. Other areas contain primarily medium and coarse sandstones of the Pocono formation, from which the Dekalb soils are derived. A few areas are mixtures of both kinds of soil. Profiles for stony soils of the Dekalb and Leetonia series are described elsewhere in this section.

These very stony soils occur primarily in association with steep yellow and brown soils on top of ridges and along the sides of valleys in the southern and west-

ern parts of the county. They also occur infrequently along the edge of the Wisconsin glacial deposits. Included are some seepage areas at the heads of streams and between rocks.

Leetonia and Dekalb very stony soils, 0 to 20 percent slopes, are extremely acid, sandy and very stony, and well to excessively drained and occur in the uplands. Areas of these soils contain huge blocks of conglomerate and coarse sandstone as large as 6 feet or more in width. They also contain smaller fragments of these rocks. In many places rocks are so numerous that they cover the ground. The average depth of these soils is normally 2 feet, but between the boulders and stone fragments the soil is slightly deeper.

Use and management.—All of this very stony soil is wooded, mainly with sparse stands of maple, beech, oak, and some birch, white pine, and poplar. Clearing this soil is not practical. In some places trees grow slowly and should not be cut. Development of soil and organic matter between the rocks is greatly needed so that rainfall can be retained, and the trees help hold the soil in place.

Leetonia and Dekalb very stony soils, 20 to 30 percent slopes (Lv; group 14A).—These moderately steep soils are similar to Leetonia and Dekalb very stony soils, 0 to 20 percent slopes, but they occur more frequently along the breaks of streams. Furthermore, much larger rock fragments and blocks of conglomerate litter their surface. Some blocks, as large as 15 feet or more in width, have dwarfed trees, including hemlock, growing on them.

Leetonia and Dekalb very stony soils, 30 to 70 percent slopes (Lw; group 14A).—These steep and very steep soils are similar to Leetonia and Dekalb very stony soils, 20 to 30 percent slopes, in that huge blocks and fragments of conglomerate and coarse sandstone rocks litter their surface. In addition to these, cliffs and exposures of ledges 5 to 30 feet high occur along the crests of hills and ridges where dissection of the plateau begins. These soils are and should remain wooded.

Lordstown Series

The well-drained, moderately shallow Lordstown soils of the uplands occur on glacial till of Wisconsin age and on postglacial residuum. This parent material was derived from sandstone and siltstone of the underlying Pocono formation. The glacial till contains a few erratics of igneous and metamorphic pebbles, cobbles, and boulders, as well as of the local rock material. In a few places where the local rock material predominates, the soils resemble the Dekalb channery loams, 10 to 25 inches deep.

The Lordstown soils are mainly on the high ridges and upper sides of valleys in the glaciated north-central and northeastern parts of the county. They occur in association with the well-drained Bath, moderately well drained Mardin, and poorly drained Volusia soils. The Lordstown soils also occur in transitional areas, where they are associated with the reddish-brown, well-drained, deep Cattaraugus soils and the shallow-to-bedrock Oquaga soils.

Lordstown channery silt loam, 0 to 12 percent slopes (L2a; group 7).—The following is a representative profile:

Surface soil—
Very dark gray to dark grayish-brown, very friable, strongly acid channery silt loam; weak medium granular structure; layer may be 4 to 6 inches thick.
Subsoil—
Dark-brown to yellow, strongly acid, very friable or friable channery silt loam that grades into firm channery silt loam of strong fine subangular blocky structure; subsoil may extend to depth of 16 inches.
Substratum—
Yellow or olive-yellow, strongly acid, very firm channery loam; weak thick platy; channery loam grades into bedrock or flaggy loose material; depth to bedrock may be 4 feet but average depth is about 2 feet.

The permeability of the soil to water is rapid.

Use and management.—More than half of this soil is wooded, one-fourth in crops, and the rest in pasture or idle. The main crop is potatoes, but the soil is also suited to cane fruits, hay, grain, and beans or other vegetables or row crops. The maple, birch, beech, some oak and pine.

Because the soil is strongly acid and low in plant nutrients, especially nitrogen, it requires heavy applications of lime and very heavy applications of complete fertilizer for good yields. Because it is shallow to bedrock, the soil tends to be droughty in summer. The surface layer could be improved by growing and plowing under cover crops and green-manure crops. Because of the hazard of accelerated erosion, contour tillage and, where possible, stripcropping and long rotations are needed.

Lordstown channery silt loam, 12 to 20 percent slopes (L2b; group 7).—This soil is similar to Lordstown channery silt loam, 0 to 12 percent slopes, except that it is more sloping and runoff is much more rapid. The hazard of erosion on cultivated land therefore is greater. Only about one-fourth of this soil is cultivated, and slightly more is in pasture or idle. All of the rest is in forest or abandoned orchards. The soil is suited to most of the crops in the area. If heavily limed and fertilized and adequately protected against erosion, it could produce fair yields.

Lordstown channery silt loam, 20 to 30 percent slopes (L2c; group 11D).—Except that it is more strongly sloping, this soil is similar to Lordstown channery silt loam, 12 to 20 percent slopes. It is also similar to Oquaga channery loam, 20 to 30 percent slopes, in that erosion is a hazard and rock outcrops occur.

Two-thirds of this soil is in forest, and slightly more than one-tenth is cultivated. The rest is in pasture or idle. The soil is best suited to forest.

Lordstown channery silt loam, 30 to 40 percent slopes (L2d; group 13B).—This steep soil occurs mainly in the north-central and eastern parts of the county. It is located in places where glacial till occurs on very strongly sloping and very steep ridges and valley walls. Many outcrops of bedrock occur along the slopes and some of these can be seen near Mills along the Cowanesque River. Most of this soil has good stands of beech, birch, maple, and some pine and hemlock.

Lordstown stony loam, 0 to 20 percent slopes (L2f; group 12).—Large blocks of Pocono sandstone are

normally scattered over the surface of this soil. The soil contains subangular striated fragments from formations within the county and large glacial boulders and erractics brought in from the outside. It occurs in the north-central and northern parts of the county at elevations higher than those of most soils derived from till. It is also along upper valley walls where rock outcrops are frequent. This soil occurs in association mainly with Bath, Mardin, and Volusia soils, but it also occurs in areas where the Cattaraugus soils predominated.

Representative profile:

Surface soil—
Wooded areas contain three layers: (1) brown mat of forest litter and about 1 inch of black decomposed leaf humus, together about 3 inches thick; (2) very dark-gray, loose, weak medium granular channery loam; (3) light-gray, loose weak thin platy channery loam 2 inches thick; all layers strongly acid and contain many gray and brownish channers of siltstone and sandstone derived from the Pocono formation, as well as a few erratics and rounded pebbles; combined layers may be 6 inches thick.

Subsoil—
Dark-brown to yellow, strongly acid, friable to firm channery loam; moderately strong medium subangular blocky structure; channery loam grades into silty loam or very flaggy loam material that extends to depths of about 16 to 18 inches.

Substratum—
Yellow or olive-yellow, strongly acid, very firm channery loam; weak thin platy structure; channery loam grades into bedrock or flaggy loose material; depth to bedrock may be 4 feet but normally is about 2 feet.

The permeability of the soil to water is rapid.

Use and management.—Almost all of Lordstown stony loam, 0 to 20 percent slopes, is wooded, but there are some small flaggy or stony pastures. The forest is mainly birch, beech, maple, black cherry, and oak, but some areas have mixtures of pine and other softwoods.

Lordstown stony loam, 20 to 30 percent slopes (L2g; group 13A).—Almost all of this soil is in forest. Clearing is not suggested because the soil is generally shallow. Even on the few acres that are in pasture or orchards, accelerated erosion is apparent. This soil is best used for forest.

Lordstown and Bath channery silt loams, 40 to 60 percent slopes (L2h; group 14B).—In this mapping unit are Lordstown and Bath channery silt loams that occur together on very steep slopes. Less steep units of these soils are described separately elsewhere in this section.

The soils are yellowish brown, shallow to deep, and strongly and very strongly acid. They are well drained and occur principally on upper valley walls and on dissected ridges in the northern part of the county.

Use and management.—Most of this unit has good stands of beech, birch, and maple. A few acres are in pasture, but the best use is for forest. Because of the 40 to 60 percent slopes, erosion is active in the grass pastures. The soils are not very stony or difficult to work, however, and some of the less steep areas could be used for pasture.

Lordstown channery silt loam, neutral variant, 0 to 30 percent slopes (L2e; group 1).—This almost neutral, moderately deep soil is outstanding because it occurs as small bands or spots along with acid soils. It occurs in isolated spots on the Allegheny Plateau, in residuum that was derived from calcareous sandstone and sandy limestone. Although residual in origin, the soil occurs in association with the Oquaga, Cattaraugus, and Culvers soils that are from reddish-brown, acid Wisconsin glacial till. On the Allegheny Plateau small spots of this soil also occur in association with Cattaraugus and Lackawanna soils that are from brown and reddish frost-worked deposits.

Representative profile:

Surface soil—
Dark reddish-brown to reddish-brown, slightly acid, very friable channery silt loam; weak fine granular structure; layer may be 10 inches thick.

Subsoil—
Dark-brown to reddish-brown, friable, medium to strongly acid silt loam; weak medium granular structure; layer may extend to depth of 30 inches.

Substratum—
Dark reddish-brown to reddish-brown, medium acid to slightly acid, firm to very firm loam; strong medium to coarse granular structure; layer grades at depth of about 3 feet into speckled, weathered, fine-grained calcareous sandstone; depth to bedrock may range from 2 to 4 feet.

The permeability of the soil to water is moderately rapid.

Use and management.—Much of this neutral variant has a good growth of maple, with some beech and basswood. About one-fifth is cultivated, mainly to potatoes, corn, beans, and oats. Other suitable crops are alfalfa, clover, and peas or other vegetables. For good yields, crops require heavy applications of fertilizer and some lime. To maintain the surface soil the more sloping parts of this soil need erosion control.

Mardin Series

The moderately well drained, very deep or deep Mardin soils are on the uplands. They occur on glacial till in the northern part of the county and on frost-worked materials in the southern part. They are associated mainly with Volusia, Bath, Woostern, and Brinkerton and Armagh soils. In the northeastern and northwestern parts of the county they are associated with the poorly drained Volusia, in the northern part with the well-drained Bath and Woostern, and in the southern part with the Brinkerton and Armagh and Bath soils.

Mardin soils occur on glacial till with Woostern, and Bath soils. This till contains a high percentage of channers and flaggy yellow and brown sandstone and siltstone fragments that were derived from the underlying Pocono formation. In this county the glacial till is normally somewhat thin; the average depth on the upper valley walls may be between 4 and 5 feet. On the lower slopes and in the valleys, however, the drift is at least 10 feet deep, and several stream and road cuts show till 20 to 40 feet deep. This till contains much pebbly and cobbly material. Depth is one of the main differences between the till and the till-like, or frost-worked, deposits that occur largely south of the drift border.

In areas of associated Mardin and Woostern soils,

the Mardin soils are generally quite cobbly or pebbly and are on materials largely morainic in origin. But in the southern part of the county, Mardin soils are mainly on frost-worked materials that have accumulated in depressions and on low valley slopes of the Allegheny Plateau. The Mardin channery loams normally occur on gently undulating interstream areas near the headwaters or drainageways, and in other locations where drainage is deficient or where seepage from higher elevations occurs.

Mardin channery silt loam, 0 to 8 percent slopes (Ma; group 3).—The following is a representative profile:

Surface soil—
Brown, strong-brown, or yellowish-brown, friable, strongly to medium acid channery silt loam; weak fine or weak medium platy structure; layer normally about 5 to 10 inches thick.
Subsoil—
Dark-brown or brown, clay loam or silt loam; mottled with yellow and gray; compact and hard when dry; strongly acid or medium acid; strong medium subangular blocky structure; layer may extend to depth of about 28 inches but average depth is 22 inches.
Substratum—
Mottled yellowish-brown and grayish-yellow, slightly to strongly acid clay loam fragipan; very hard when dry; fragipan is 2 to 3 feet thick; strong coarse subangular blocky structure; layer grades into compact mottled gray and yellow glacial till or flaggy frost-worked deposits of considerable depth.

The permeability of the soil to water is slow.

Use and management.—Before the area was settled, mixed pine and hardwoods occupied this soil. Several areas in the Oswayo and Eleven Mile Valleys had almost pure stands of white pine. These areas contain more sandy and loose materials in the substratum than the typical Mardin channery silt loam, 0 to 8 percent slopes.

More than half the soil is wooded, about one-fifth is in crops, and the rest is idle or in pasture. The forests consist mainly of birch, beech, maple, and some oak. Clover and timothy hay normally are grown in rotation with crops.

The soil is best suited to pasture, oats, barley, wheat, and corn. Potatoes can be grown if the soil is drained. Diversion terraces, constructed at the base of slopes that are higher than those of the Mardin soils normally provide enough drainage for crops. In a few places there are small spots of Volusia or other poorly drained soils within this soil. These small areas need tile drains if corn and potatoes are to be grown.

For best crop yields, the soil requires heavy applications of a mixed fertilizer high in nitrogen, as well as side dressings of nitrogen. Complete fertilizer or manure reinforced with superphosphate is most commonly used.

Mardin channery silt loam, 8 to 15 percent slopes (Mb; group 6).—Except that it is more sloping, this soil is similar to Mardin channery silt loam, 0 to 8 percent slopes. It is on the sides of valleys and kamelike morainic areas where much of the relief is distinctly billowy. The short complex slopes of these areas are not suited to contour tillage or diversion terraces. Almost two-thirds of this soil is in forest, and only about one-sixth is cultivated. Much of the rest is in pasture or lies idle.

Mardin channery silt loam, 15 to 25 percent slopes (Mc; group 11C).—This soil is similar to Mardin channery silt loam, 8 to 15 percent slopes, except that it is more sloping and billowy. In some included low areas between knolls, seepage or thin muck deposits occur. Areas of this soil that are associated with Woostern soils are normally too rolling for contour tillage or diversion terraces. Furthermore, the gravelly nature of the soil makes it less suited to crops than other Mardin soils that are better drained. This soil is not used so much for crops as Mardin channery silt loam, 8 to 15 percent slopes, and more is pastured. Because of the risk of erosion, cultivated areas require contour tillage, stripcropping, and cover crops.

Mardin channery silt loam, 25 to 35 percent slopes (Md; group 13B).—This steep soil occurs mainly near the stream valleys and along the ridges where seepage is common. The soil stays damp throughout the year despite the steep slopes and high runoff. It is therefore best suited to forest, but some of it has been cleared and is in either pasture or cane fruits. The soil is well suited to such cane fruits as blackberries. It is not suited to orchards and only moderately suited to potatoes and grain. If this soil is cultivated, long rotations, cover crops, and other erosion control measures are essential to maintain the surface soil. In addition, the soil needs very heavy applications of lime and complete fertilizer.

Middlebury Series

The moderately well drained, deep Middlebury soils occur on the bottom lands on recent stream alluvium. This alluvium consists mainly of sands and silts and contains some gravel in the substratum. These soils are in almost all of the major stream valleys, where they occur in association with well-drained Tioga, poorly drained Holly, and very poorly drained Papakating soils. The Middlebury soils are flooded at least once and frequently two or three times a year, mostly in spring and late in fall.

Middlebury sandy loam, 0 to 3 percent slopes (Me; group 4B).—This soil occurs mainly on bottom lands in the narrow valleys of the southern part of the county, particularly along Freeman Run and Sinnemahoning Creek. Because the streams are more rapid in these areas than in the northern part of the county, more coarse material is deposited by them.

Representative profile:

Surface soil—
Dark grayish-brown, strongly acid, very friable sandy loam; layer may be as deep as 8 to 9 inches and may grade into yellowish-brown sandy loam that extends 3 to 4 inches more.
Subsoil—
Slightly to strongly mottled yellowish-brown and gray or yellow, gray, and brown, strongly acid, friable sandy loam that may grade into firm clay loam; subsoil extends to depths of 24 to 34 inches.
Substratum—
Mottled gray and yellow, strongly acid, firm gravelly sandy clay that grades into gravel and sand at an average depth of 4 feet or more; depth to hard material may range from 3 to 8 feet or more.

The permeability of the soil to water is moderately slow.

Use and management.—More than one-third of this soil has good stands of hemlock, sycamore, elm, soft maple, willow, and poplar. Much of the soil is cleared, and the cleared soil is about equally divided as pasture and idle land. Only a few scattered fields on the less flooded areas have been cultivated. The main crops are oats and corn, grown in rotation with timothy and clover. Heavy applications of lime and fertilizer are needed for both pasture and crops. The soil is generally too wet for apples, potatoes, peas, and beans.

Middlebury silt loam, 0 to 3 percent slopes (Mf; group 4B).—This soil occurs mainly in the northern parts of the county along the larger streams that have less fall than those in the southern part. The soil is extensive. Its texture is generally finer than that of Middlebury sandy loam, 0 to 3 percent slopes.

Representative profile:

Surface soil—
Thin layer of humus or silt and an accumulation of fine gravel from stream wash may cover a few areas; mineral soil dark grayish-brown to yellowish-brown, medium to strongly acid very friable silt loam; moderately strong medium crumb structure; surface soil may be 5 to 12 inches thick.

Subsoil—
Slightly to strongly mottled yellowish-brown, gray, and yellow, medium acid silty clay or silty clay loam; hard when dry, slightly plastic when wet; weak medium platy structure; layer may extend to a depth of 24 inches.

Substratum—
Mottled gray and yellow, medium acid, stiff and plastic fine sandy clay that grades into gritty clay or silty clay of strong thick platy structure; gritty clay or silty clay grades into very weak thick platy layers of fine sandy clay, gravel, or flaggy deposits; average depth to hard material may be 4 feet or more, but depths may range from 3 to 8 feet or more.

The permeability of the soil to water is slow.

The profile varies from place to place in the amount of gravel in the substratum, the thickness of the overlying silt and clay deposits, and the degree of mottling in the lower subsoil. All areas, however, have more than a foot of material that is free from mottling.

Use and management.—More than one-third of Middlebury silt loam, 0 to 3 percent slopes, is pastured, and a slightly larger acreage is wooded. Only about one-tenth is cultivated. The wooded area has good stands of hemlock, sycamore, elm, willow, maple, and poplar. Oats, some corn, and clover and timothy hay are the main crops. The soil is well suited to pasture and, if properly limed and inoculated, would probably grow alfalfa. It is less acid than most of the bottom-land soils of the county, and moderately heavy applications of lime are normally sufficient for pasture and hay. Heavy applications of complete fertilizer and manure are needed for best yields.

Middlebury silt loam, high bottom phase, 0 to 3 percent slopes (Mg; group 4B).—This medium to strongly acid, yellow and brown, mottled soil is on mixed alluvium that occurs on small benches in the present stream bottoms. Because of the bench position, this soil is not flooded so frequently as Middlebury silt loam, 0 to 3 percent slopes, and is therefore more suited to crops. It resembles the typical silt loam but varies more in texture. Some parts of this high bottom phase may contain gravelly and sandy spots that cause droughtiness. But most of the soil is a loam or silt loam, and the sequence of layers is similar to that of Middlebury silt loam, 0 to 3 percent slopes. Like the typical silt loam, the high bottom phase is associated with Tioga and Holly soils.

Use and management.—About one-third of this soil is in pasture and almost one-fourth in crops. Most of the rest has good stands of hemlock, elm, soft maple, willow, and poplar. Corn, oats, clover, and timothy hay are the main crops, and there are some beans and berries. Heavy applications of lime and fertilizer are needed for good yields.

Minora Series

The well-drained, shallow to very shallow Minora soils of the uplands occur on reddish shales of the Catskill and Mauch Chunk formations. These soils occur primarily in the southeastern part of the county near the head of Marvin Run, where they are associated with the deeper Lackawanna soils. Areas of Minora soils are small. Minora soils are similar to the Oquaga soils in depth to bedrock, but they are much redder and finer textured.

Minora silt loam, 0 to 12 percent slopes (Mh; group 7).—The following is a representative profile:

Surface soil—
Normally 2 or 3 inches of forest litter on surface; mineral soil is dark-red, strongly acid, friable channery silt loam about 5 inches thick; strong fine granular structure.

Subsoil—
Red to weak-red or dusky-red, strongly acid, friable to very firm channery silty clay; strong fine subangular blocky structure; layer extends to depths of 20 to 30 inches and within a few inches grades into a mixture of silty clay and fragments of weathered red shale and siltstone.

Substratum—
Laminated fractured masses of red shale surrounded by soil material; soil material has a weak thick platy structure and is strongly acid; average depth to bedrock is 1½ feet; depths generally range from ½ to 3 feet; a few spots may be 4 feet deep.

The permeability of the soil to water is moderately rapid.

Use and management.—Almost all of this soil has good stands of maple, beech, and some oak, pine, and hemlock. The soil is well suited to small grains and hay or corn, but its texture is too fine for potatoes, peas, beans, and orchard fruits. Other than forest, the best use is for pasture, but adequate lime, manure, and phosphorus must be used. Moderately heavy applications of complete fertilizer and heavy applications of lime are needed for best yields.

Minora silt loam, 12 to 20 percent slopes (Mk; group 7).—This soil is similar to Minora silt loam, 0 to 12 percent slopes, but outcrops of red shale are numerous. Because it is fine textured and shallow this moderately steep soil is easily eroded. It is used entirely for forest, for which it is well suited.

Minora silt loam, 20 to 30 percent slopes (Mm; group 11D).—This soil is similar to the less strongly slop-

ing Minora silt loams, but it is more erodible and shallow and outcrops of red shale are more numerous. Like Minora silt loam, 12 to 20 percent slopes, almost all of this inextensive soil is used for forest.

Mixed Alluvium

Mixed alluvium is a mixture of recent overflow materials from streams in the narrow valleys of the county. Many areas are a succession of very small knolls and depressions in places where Middlebury and Holly soils predominate. In other areas this land type consists of long levees of sandy soil bordered by narrow bands of silty material that were deposited by slack water. This land type ranges from poorly drained to moderately well drained.

Mixed alluvium, 0 to 5 percent slopes (Mn; group 9).—Most of this land type is sand and gravel, but some silt and cobbly materials also occur. Large blocks of conglomerate and coarse sandstones litter many of the narrow valley heads in the steeper parts of the county. Frequent flooding that deposits gravel and cobbles or sand at the mouths of the streams is harmful. Most of this land type is strongly acid.

Use and management.—Practically none of this mixed alluvium is cultivated. About two-thirds is in mixed deciduous and coniferous forest, almost one-tenth in pasture, and more than one-fifth is idle. The forest is mainly beech, maple, and hemlock. All of this land type could be improved by clearing the stream channels, and in some places it would be helpful to reroute the streams. Some stone-free areas are suitable for pasture, and a few acres might be cropped, but the best use is for forest.

Morris Series

The poorly drained, very deep to deep Morris soils of the uplands occur on glacial till and frost-worked deposits that are compact and hard when dry. In the northeastern part of the county these materials contain erratics and cobbles from glacial drift (fig. 8) but the frost-worked materials in the south are largely from red and green siltstone and sandstone of the Catskill formation. The Morris soils are in low valleys and interstream areas. They occur in association with and on materials similar to those of well-drained Cattaraugus and Lackawanna and the moderately well drained Culvers and Wellsboro soils. They are also associated with the very poorly drained Norwich soils on reddish-brown materials.

Morris silt loam, 0 to 3 percent slopes (Mo; group 8A).—The following is a representative profile:

Surface soil—
Dark-brown, strongly acid, friable silt loam; strong medium granular structure; layer may be 7 to 9 inches thick.

Subsoil—
Intensely mottled yellowish-red and pink or brownish-gray, red, and brown, strongly acid, very firm channery loam or silt loam; strong medium subangular blocky structure; layer may extend to depth of 30 inches, where it is extremely hard when dry.

Figure 8.—**Morris silt loam along a creek east of Mills. The parent material is very deep, compact glacial till.**

Substratum—
Dark reddish-brown or mottled pink and yellowish-red, strongly acid, compact, very hard fine sandy clay, silt loam, or clay loam; strong medium to coarse subangular blocky structure (some areas may have a strong thick irregular platy structure); subsoil grades into very deep hard glacial till that may range from 4 to 20 feet in depth to bedrock; average depth may be about 6 feet or more.

The permeability of the soil to water is slow.

Use and management.—About one-fourth of this soil is wooded, and one-third cultivated. The rest of the soil is equally divided as pasture and idle land. The main crops are oats, corn, clover hay, and mixed clover and timothy hay. These crops are grown in rotation. The wooded areas have good stands of hemlock and maple.

In many areas, tile, open drains, or diversion terraces are used to remove excess water so that the soil may become dry enough for cultivation. Much lime and fertilizer are needed for good yields. Because the soil is poorly drained and nearly level, it is best suited to pasture. It is too wet for apples, peas, beans or other crops that require a well-drained soil.

Morris silt loam, 3 to 8 percent slopes (Mp; group 8A).—A profile of this soil on its parent material is shown in figure 8. Because external drainage is slightly greater than that of Morris silt loam, 0 to 3 percent slopes, this soil is better suited to small grains and corn. But like the less sloping soil, it is best used for pasture.

Morris silt loam, 8 to 15 percent slopes (Mr; group 8A).—Although external drainage on this gently sloping soil is adequate for small grains and corn, diversion terraces are needed to prevent the land from flooding during heavy showers. Poor internal drainage prevents the soil from absorbing the rainfall rapidly enough to control flash floods and erosion.

Morris silt loam, 15 to 25 percent slopes (Ms; group 10A).—Runoff is rapid on this moderately steep soil,

but seepage from many springs keeps the soil moist most of the time. The soil is used largely for pasture, for which it is well suited.

Morris silt loam, 25 to 50 percent slopes (Mt; group 14B).—Areas of this soil are small. They normally occur around springs on the steep sides of valleys. The soil is generally pastured or wooded, but a few acres are idle. The best use of this soil is for forest.

Morris stony silt loam, 0 to 15 percent slopes (Mu; group 10B).—This stony soil occurs mainly in the northern part of the county along the headwaters of streams and across stream divides. Smaller areas occur along the low gentle slopes of the wider valleys. Good examples may be found near Ulysses and Roulette. The soil occurs in association primarily with the stony soils of the Cattaraugus and Culvers series. Its surface is covered by pebbles and boulders or subangular flagstones and slabs of the Catskill formation.

Representative profile:

Surface soil—
Very wet, somewhat compact, rotted accumulation of twigs and leaves, 3 inches thick, overlies about 5 inches of dark-brown, strongly acid, friable silt loam; mineral layer has weak medium platy structure.

Subsoil—
Mottled olive-yellow and light reddish-brown to intensely mottled red, brown, and gray strongly acid clay loam; compact and hard; strong medium subangular blocky structure; layer extends to depth of 20 inches.

Substratum—
Mottled gray and reddish-brown, very hard and compact, strongly acid glacial till that contains a few pebbles of gneiss and granite; layer may be as deep as 20 feet or more but average depth to bedrock is about 6 feet or more.

The permeability of this soil to water is slow.

Included are areas that are slightly better drained and areas that are more poorly drained than those of the typical soil. These areas may include spots of Culvers and Norwich soils.

Use and management.—More than half of Morris stony silt loam, 0 to 15 percent slopes, is wooded with good stands of hemlock, maple, and yellow birch. About one-third is pastured, and the several stony pastures near Ulysses seem good. The soil is generally too wet to be drained for crops, but it is suited to pasture. Pastures can be improved by removing stones, constructing diversion terraces, and applying lime and phosphorus.

Morris stony silt loam, 15 to 25 percent slopes (Mv; group 10B).—About half of this moderately steep soil is wooded. The rest is in pastures or idle. External drainage is more rapid on this soil than on Morris stony silt loam, 0 to 15 percent slopes, but internal drainage is too poor for the soil to be cleared and used for crops. For good results, pastures require diversion terraces and heavy applications of lime and phosphorus.

Morris stony silt loam, 25 to 50 percent slopes (Mw; group 14A).—The acreage of this soil is smaller than that of Morris stony silt loam, 15 to 25 percent slopes. The soil occurs in seepage areas around springs on the steep hillsides. About half of it is wooded, and the rest is in steep pastures. The soil is too steep, too stony, and too wet for crops, but it can be developed into good pastures. Nevertheless, this soil should be kept in forest.

Nolo Series

The poorly drained, moderately deep Nolo soils of the uplands occur on mixed residual materials. These materials were derived primarily from fine-grained sandstones of the Pocono formation, but they may include some gray and brown siltstone and sandstone of the Pottsville and other formations. These soils occur in shallow basins on the tops of the highest ridges in the southern part of the county. They also occur around the head streams of drainage channels on top of the Allegheny Plateau.

Two Nolo soils are mapped in the county—Nolo channery silt loam, 0 to 8 percent slopes, and Nolo stony sandy loam, sandy variant, 0 to 12 percent slopes. The Nolo channery silt loam occurs in association mainly with well-drained Dekalb and Clymer and the moderately well drained Cookport soils. It is also associated with the very poorly drained Chippewa soils. Some areas of Nolo stony sandy loam, sandy variant, are associated with the Leetonia soils.

Nolo channery silt loam, 0 to 8 percent slopes (Na; group 8A).—The following is a representative profile:

Surface soil—
Light brownish-gray, extremely acid, friable channery loam that contains a few large fragments of sandstone; weak fine granular structure; layer may be 3 to 4 inches thick.

Subsoil—
Pale-brown channery silt loam or channery loam mottled with gray and yellow; strongly to extremely acid; contains a few grayish-brown sandstone fragments; weak fine granular structure; channery silt loam or channery loam grades into light yellowish-brown silty clay loam mottled with gray; silty clay loam is firm and has moderately strong fine subangular blocky structure; (lower subsoil may be sandy clay loam in some places); subsoil extends to depth of 20 inches.

Substratum—
Mottled gray and pale-yellow, extremely acid, very firm silty clay loam or sandy clay loam; strong thick platy structure; substratum grades into weathered siltstone and sandstone of the Pocono formation at depths varying from 2 to 7 feet; average depth to bedrock about 4 feet.

The permeability of the soil to water is slow.

Use and management.—Practically all of this Nolo channery silt loam has mixed stands of hemlock, birch, maple, and beech. Some included areas of silt loam have been cleared and are pastured. Manure and heavy applications of lime and phosphorus will improve the pastures.

Nolo stony sandy loam, sandy variant, 0 to 12 percent slopes (Nb; group 10B).—This soil occurs on coarse residual materials that were derived from coarse sandstone and conglomerate of the Pocono and Pottsville formations. The soil is similar to the Nolo channery silt loam in drainage, color, and depth, but in texture this sandy variant is much coarser. Furthermore the sandy variant is more leached; it may have a gray layer 5 to 6 inches thick. Blocks and fragments of quartz conglomerate litter the surface of

this soil, and in contrast the surface of the silt loam has only a few blocks or fragments.

This sandy variant occurs mainly on top of the highest ridges in the southern part of the county. It is associated with moderately deep, well-drained Leetonia and very poorly drained, coarse-textured Chippewa soils.

Representative profile:

Surface soil—
Many large blocks of Pottsville conglomerate litter the surface; under blocks is a dark-gray to black or very dark brown mixture of organic material and extremely acid, loose sandy loam; weak medium granular structure; mixture is underlain by light-gray sandy loam stained with dark streaks along root channels; very strongly acid; weak granular structure; loose surface soil extends to depth of 11 inches, where it grades into discolored brown and light-gray, firm, very strongly acid sandy loam; weak thick platy structure; surface soil may be as deep as 13 or 14 inches.

Subsoil—
Mottled gray and yellow, sometimes saturated, extremely acid, firm coarse sandy loam that contains nodules or small lumps of sandy clay and fragments of quartz and conglomerate; weak medium subangular blocky structure.

Substratum—
Subsoil grades into coarse sandstone or conglomerate at depths that may reach 4 or 5 feet; average depth to bedrock probably about 3 feet.

The permeability of the soil to water is slow.

Use and management.—All of this soil is wooded with good stands of hemlock, birch, beech, and maple, under which there is a growth of ferns. The soil is much too wet and far too stony and coarse textured for cultivation.

Norwich Series

The very poorly drained Norwich soils of the uplands occur on glacial till and thick frost-worked materials that resemble till. The soils are situated in basins and around the headwaters of streams in almost all parts of the county where Lackawanna and Cattaraugus soil materials predominate. They also occur in areas occupied by very poorly drained reddish soil materials.

The Norwich soils occur in association with and on materials similar to those of the well-drained Cattaraugus and Lackawanna soils. They are also associated with the moderately well drained Culvers and Wellsboro and the poorly drained Morris soils.

Norwich silt loam, 0 to 15 percent slopes (Nc; group 8C).—The following is a representative profile:

Surface soil—
Dark-brown or black, extremely acid, mucklike silt loam that grades into a dark grayish-brown, very strongly acid silt loam of weak medium granular structure; surface soil may be 7 inches thick.

Subsoil—
Pale-brown silt loam slightly mottled with gray; very strongly acid; firm; silt loam grades into mottled red, brown, yellow and gray clay loam; very firm or compact; strongly acid; somewhat saturated; subsoil may extend to depth of 20 inches.

Substratum—
Mottled gray and brown, strongly acid, very stiff and plastic clay loam or stony and flaggy glacial till; average depth of soil may be about 8 feet.

The permeability of the soil to water is very slow.

The underlying material varies from place to place. This material may be red and plastic in some places and flaggy and brown in others. The surface soil may be grayish brown instead of dark brown, but the mottled layers are usually red and gray. Included with this soil are some incipient drainageways that may contain boulders and stones. These boulders and stones are normally shown by appropriate symbols.

Use and management.—Although Norwich silt loam is one of the wettest soils in Potter County, much of it is cleared and pastured, particularly in the northeastern part of the county. Small acreages in fields that are better drained than normal can be artificially drained and planted to oats and other small grains, clover, and mixed clover and timothy hay. About one-fifth of this soil remains wooded. Much of this wooded area has good mixed stands of red maple, hemlock, larch, and willow. Other areas have dense growths of cattail, tall grasses, and rushes or sedges and only sparse stands of hemlock, larch, and red maple and some yellow birch. The soil is best suited to forest but, if drained, can be used for pasture.

Norwich stony silt loam, 0 to 15 percent slopes (Nd; group 10B).—This soil is similar to Norwich silt loam, 0 to 15 percent slopes, but the many boulders, stones, and rock fragments on the surface make clearance, drainage, and cultivation impractical. Scattered areas of this soil occur throughout the central and northern parts of the county in basins and around the headwaters of streams that drain areas underlain by materials of the Catskill formation. In some places water stands in depressions between high mounds most of the time.

Reddish and greenish-gray sandstone fragments are common in the central part of the county, and a few boulders, cobbles, and pebbles from granite, gneiss, and similar rocks occur in the northern part. In many places a rank growth of tall grasses, sedges, or rushes completely hide these stones. In other places sparse growths of hemlock, larch, and red maple accompany the tall grass.

Use and management.—This stony soil is partly cleared and used for pasture because it stays moist all year. The pastures are not improved, because it is believed that they would not be worth the lime and fertilizer needed to improve them. Because of its stoniness and very poor drainage, this soil should be kept in forest. It can support good stands of hemlock, larch, red maple, and yellow birch.

Oquaga Series

The well-drained, shallow-to-bedrock Oquaga soils of the uplands occur on glacial till or on a mixture of frost-worked deposits and residuum. The deposits contain channery and flaggy material from the Catskill formation. Much of the till also contains a few pebbles and cobbles of metamorphic and igneous rock.

These soils are situated on high ridges and along valley walls that show many exposures of the Catskill

formation. They occur in association with deep, well-drained Cattaraugus and Lackawanna and moderately well drained Culvers and Wellsboro soils. They also are associated to a limited extent with the poorly drained Morris soils.

Oquaga channery loam, 0 to 12 percent slopes (Oa; group 7).—The following is a representative profile:

Surface soil—
Brown to dark reddish-brown, strongly or very strongly acid, very friable channery loam; strong to weak medium granular structure; layer may be 5 to 7 inches thick.
Subsoil—
Brown to reddish-brown or yellowish-red, very strongly or strongly acid, friable to moderately firm channery loam; structure in some places is moderately strong medium subangular blocky and in others is weak coarse subangular blocky; layer may extend to depths of 22 to 24 inches.
Substratum—
Weak-red or reddish-brown, very strongly acid, firm channery loam or flaggy loam; weak medium subangular blocky or weak thick platy structure; channery or flaggy loam grades into horizontal beds, of red, brown, and greenish flaggy and channery sandstone and siltstone of Catskill formation that is fine and medium grained; average depth to bedrock 2 feet, but depth may range from 1 to 3 feet; a few areas may be as deep as 4 feet.

The permeability of the soil to water is rapid.

Use and management.—More than two-thirds of this soil is wooded, and about one-seventh is cultivated. A small part is in pasture, and the rest is idle. The forest contains oak, pine, beech, and other hardwoods. This soil is best suited to potatoes and oats, but it is also well suited to other small grains, beans, peas, clover and other hay crops, cane fruits, and blueberries. With careful management most of the crops of the area can be grown, but in dry summers the soil is not suited to corn.

The slopes of this soil are gentle. Erosion is not active, but the soil tends to be droughty because it is shallow. This soil needs long rotations and cover crops to be plowed under. Heavy applications of lime and complete fertilizer are needed for good yields.

Oquaga channery loam, 12 to 20 percent slopes (Ob; group 7).—If cultivated, this soil is erodible. Because the soil normally is shallow, erosion generally is more serious than on deeper soils. Contour tillage, long rotations, stripcropping, and cover crops are needed to prevent erosion. On the steeper slopes terracing and permanent pastures are also needed.

Oquaga channery loam, 20 to 30 percent slopes (Oc; group 11D).—This soil is similar to the less strongly sloping Oquaga channery loams except that it is more eroded, shallow spots are more evident, and the ledges are more pronounced. The soil is normally not cultivated, but about one-quarter is cleared and is in orchards or pasture, or lies idle. Perhaps one-tenth is cultivated as parts of fields that consist mostly of deeper soils. The slopes are generally too steep for cultivation, but this shallow soil can be used for permanent pasture or orchards.

Oquaga channery loam, 30 to 50 percent slopes (Od; group 14B).—Except that this soil is more steep and shallow, it is similar to Oquaga channery loam, 20 to 30 percent slopes. The soil is much too thin and has far too many ledges or too much flaggy material for cultivation. Almost all of it is wooded. Only a few scattered areas are in pasture or orchards.

Oquaga stony loam, 0 to 20 percent slopes (Oe; group 12).—This upland soil occurs primarily on glacial till or frost-worked deposits that overlie materials of the Catskill formation. Fragments of fine-grained greenish sandstone and siltstone are prominent. The glaciated area contains a few pebbles, cobbles, and boulders of igneous and metamorphic rock. Large flagstones of the Catskill formation normally litter the surface and may accumulate as talus deposits at the bases of steep slopes.

Representative profile:

Surface soil—
Three thin layers, each 1 to 2 inches thick: (1) dark-brown mixture of forest litter about 2 inches thick; (2) dark grayish-brown or reddish-brown, very strongly acid, very friable stony loam; weak medium granular structure; stony loam may extend 2 inches or more below litter; (3) light-gray, very friable, very strongly acid loam; weak thin platy structure; loam may be 1 to 2 inches thick; total thickness of mineral soil may be 3 to 4 inches.
Subsoil—
Dark-brown, friable (slightly hard when dry), strongly acid stony or flaggy loam; moderately strong coarse granular structure; at depths of 5 to 6 inches subsoil grades into reddish-brown, strong-brown, or yellowish-brown stony or flaggy loam; friable (slightly hard when dry); very strongly acid; weak fine subangular blocky structure; subsoil extends to depths of 16 to 23 inches.
Substratum—
Yellowish-red or strong-brown, firm (hard when dry) stony or flaggy loam that grades into weathered greenish sandstone and siltstone of the Catskill formation; bedrock may be on surface or as deep as 3 feet; average depth to bedrock is 1 foot but in a few places depth may be 4 feet.

The permeability of the soil to water is rapid.

Use and management.—Almost all of this soil is wooded and supports a good stand of oak, beech, pine, and some birch, hickory, and other hardwoods. Only a small part is suitable for cultivation, but with careful management most of the crops of the county can be grown. Suggested use and management is the same as for Oquaga channery loam, 0 to 12 percent slopes.

Oquaga stony loam, 20 to 30 percent slopes (Of; group 13A).—This moderately steep or shallow stony soil is used almost exclusively for forest. Rocks crop out frequently, and slopes are entirely too irregular for cultivation. A few spots of this soil may occur in pastures or orchards within areas of deeper soils that have been cleared.

Oquaga stony loam, 30 to 60 percent slopes (Og; group 14A).—Except for its stronger slope this soil is similar to Oquaga stony loam, 20 to 30 percent slopes. In many places the soil areas resemble steps because they are on benches and sharp steep escarpments. Ledges and large slabs of rock from the Catskill formation are prominent on most of this soil. The best use of this soil is for forest.

Papakating Series

Only one Papakating soil—Papakating silt loam, 0 to 3 percent slopes—is mapped in the county. It is very poorly drained and occurs in the bottom lands on deep recent alluvium along the streams. This alluvium is mainly silt and clay, and some fine sand. In only a few places are stream sediments coarser than sand. This soil occurs in association with and on materials similar to those of the well-drained Tioga, the moderately well drained Middlebury, and the poorly drained Holly soils.

Papakating soils are almost always situated where ponding may occur along the flood plains. In this county, Papakating silt loam is in all the large and in some of the small valleys. Ponding frequently occurs, and in some places deposits of muck cover the surface of the soil.

Papakating silt loam, 0 to 3 percent slopes (Pa; group 9).—The following is a representative profile:

Surface soil—
Several inches of black or dark-brown, very friable, strongly acid, mucklike silt loam with or without a covering of organic matter 2 to 10 inches thick.

Subsoil—
About 7 to 8 inches of mottled, dark-gray and yellow friable to firm silt loam (in some places gritty); very strongly acid to medium acid.

Substratum—
About 15 to 20 inches of mottled gray and yellow or brown loam; silt loam, or fine sandy clay loam; firm to compact; medium acid; layer may rest on gravel or continue to clay and fine sand; average depth to bedrock may be 4 feet or more, but depths range from 3 to 10 feet or more.

The permeability of the soil to water is very slow.

Use and management.—Most of this soil is wooded and supports sparse to thick stands of hemlock, spruce, willow and larch and some red maple and yellow birch. Generally these areas have a lush understory of alders, tall grasses, rushes and other water-tolerant plants. A few acres in fields of better drained soils have been cleared and are pastured or idle. The best use of this soil is for forest. Black spruce, white spruce, or hemlock is especially suitable for planting. The soil can also be used for pond sites.

Peat and Muck

Peat and muck occur principally north of Eleven Mile in a basin that is the floor of an old glacial spillway or abandoned stream channel. Small spots are found in association with kame and outwash deposits that are the parent materials of the Woostern, Chenango, and the gravelly Mardin soils. These spots are normally depressions that have become filled with organic materials. Most of them are located near Ellisburg, and Gold, on the top of Cobb Hill.

Peat and muck, undifferentiated, 0 to 3 percent slopes (Pb; group 9).—This acid accumulation of black, decomposed mixed remains of coniferous and deciduous trees, sedges, grasses, and other plants is normally about 5 feet deep, but depths range from 1 to more than 5 feet. The deposit north of Eleven Mile contains 3 to 4 feet of well-decomposed, black, granular muck that is saturated to the surface. This muck is underlain to a depth of at least 5 feet by brown fibrous peat that contains remnants of grasses and sedges.

Most of this land supports a stand of conifers and, along the borders of the deposits, mixed maple, hemlock, and birch. In some places the trees are dying, perhaps because of extreme changes in depth of the water table. In other places the trees are in good condition.

Generally the organic deposits are too small and limited for commercial excavation. Eventually they may have some use as a source of material for greenhouses and hotbeds. The deposit at Eleven Mile is used for pasture, but, because animals may bog down, use for pasture is not recommended.

Red Hook Series

The only soil of this series mapped in the county is Red Hook silt loam, 0 to 3 percent slopes. This very deep soil on glacial outwash and stream terraces occurs on alluvium. The alluvium was derived from sandstones and shales that have been reworked and deposited along the principal streams of the county. The soil is generally situated in long narrow areas adjacent to the uplands and in depressions on the terraces. It occurs in association with reddish and yellowish soils of the terraces that are better drained. Red Hook silt loam, however, is more closely associated with the Unadilla, Chenango, and Scio soils than with the reddish Tunkhannock and Vrooman soils.

Red Hook silt loam, 0 to 3 percent slopes (Ra; group 9).—All of this soil is normally above flood water. Nevertheless, mottling caused by poor drainage is the most constant characteristic of this soil.

Representative profile:

Surface soil—
Rotted mucklike mat of plant detritus about 3 inches thick; plant detritus overlies very dark gray, very strongly acid silt loam; very friable (slightly sticky when wet); weak fine granular structure; mineral soil about 6 inches thick.

Subsoil—
Mottled dark-gray and yellow or yellowish-brown, compact and firm, strongly acid, silt loam; weak thick platy structure; subsoil may grade into gravel and sand at depths of 18 to 20 inches but often grades into a substratum of silty clay loam.

Substratum—
Mottled brown and gray, strongly acid, friable to firm silty clay loam; frequently saturated; weak thick platy structure; layer extends to depths of 28 inches or more and overlies compact layers of sand and gravel; average depth to hard material about 8 feet, but depths may range from 5 to 30 feet.

The permeability of the soil to water is slow.

Included with this soil are soils of various textures. Some areas are sandy, some are loamy, and some contain gravel deposits. A few areas have heavier textures and some of these may have a few inches of muck on the surface. Generally, however, the silt loam predominates. In some areas gravel hinders tillage, and these are shown on the map by appropriate symbols.

Use and management.—Almost all of this soil is used for pasture or forest or is idle. The forest is generally such water-tolerant trees as alder, willow,

spruce, hemlock, and red maple. Sedges, rushes, and tall grasses form an undergrowth. The pastures normally are unimproved. They have dense growths of water-tolerant tall grasses and high shrubs.

Riverwash

Riverwash is confined to the present stream channels and recent flood deposits. The areas of this land type are narrow and inextensive. They occur more frequently along the larger streams that drain to the south from steep and hilly land than they do along the streams that drain from the northern till area.

Riverwash, 0 to 3 percent slopes (Rb).—This land type is composed of sand, gravel, and boulders or a combination of these. It is subject to constant stream action and supports little or no vegetation. Riverwash is used only for building materials.

Scio Series

The Scio soils of this county are Scio fine sandy loam, Scio silt loam, and a mixture of these two. All these are mapped together as one soil unit—Scio fine sandy loam—silt loam, 0 to 3 percent slopes.

These moderately well drained, deep soils of the stream terraces occur on mixed alluvium. The alluvium contains fragments of acid gray siltstone and sandstone from the Pocono and Pottsville formations and some materials from Chemung formation. The soils are located mainly along the central and northern streams where terraces are well developed.

Scio fine sandy loam—silt loam, 0 to 3 percent slopes (Sa; group 3).—The following is a representative profile:

Surface soil—
Dark grayish-brown or brown, strongly acid, friable fine sandy loam or silt loam; weak or moderately strong medium granular structure; layer may be as deep as 10 inches but normally is 7 to 9 inches deep.

Subsoil—
Pale yellowish-brown, strongly acid, friable fine sandy loam that is structureless or silt loam that is weak medium granular; (in some places silt loam seems thick platy); layer grades into mottled yellow and brown or grayish-brown, strongly acid, friable (in places firm) sandy clay or clay loam; sandy clay or clay loam may be gravelly and of weak thick platy structure; subsoil may extend to depths of 18 to 30 inches.

Substratum—
Stratified sandy clay, gravel, and sand layers; very strongly or strongly acid; mottled, and somewhat wet most of the time; average depth to hard material may be 8 feet or more, but depths range from 5 to 30 feet or more.

The permeability of the soil to water is moderately slow.

Use and management.—More than one-third of this soil is in crops, about one-fifth is in pasture, and almost one-fifth is idle. The rest is wooded. The main crops are corn, oats, beans, clover, and timothy hay. With heavy applications of lime and complete fertilizer, good yields can be obtained. Manure and dressings of nitrogen are also needed for corn and vegetables. Pastures are generally improved, and carrying capacities are good. Lime, phosphorus, and nitrogen or manure are required for good pastures. The wooded areas have good stands of maple, beech, elm, and other hardwoods. The soil is well suited for pasture and to the crops normally grown on it.

Sweden Series

The well-drained, deep Sweden soils of the uplands occur partly on old pre-Wisconsin colluvial or frost-worked deposits and partly on material that contains large amounts of greenish and brown fine-grained sandstone and siltstone of the Catskill and Pocono formation. The Sweden soils are somewhat similar to Germania soils in color of the subsoil but differ in having more materials that are angular and coarse. They occur in small 2- to 15-acre areas that are scattered in the southern and central parts of the county. In this county, Sweden soils are not associated to a large extent with the soils of any particular series, but they occur most frequently next to Cattaraugus and Lackawanna soils near the crests of ridges or the tops of slopes.

Sweden loam, 0 to 12 percent slopes (Sb; group 1).—The following is a representative profile:

Surface soil—
Yellowish-brown, very strongly acid, very friable loam; weak fine granular structure; layer may be about 7 inches thick.

Subsoil—
Yellowish-brown, strongly acid, friable channery loam; weak medium subangular blocky structure; channery loam abruptly overlies yellowish-red or red firm channery loam; weak to moderately strong medium subangular blocky structure; subsoil may be as deep as 30 inches.

Substratum—
Reddish-brown, red, or yellowish-red, very strongly acid, channery silty clay loam; very firm (hard when dry); moderately strong fine subangular blocky structure; average depth to bedrock is possibly 4 feet, but depths range from 3 to 7 feet or more.

The permeability of the soil to water is moderately rapid.

Use and management.—More than half of this soil is wooded, about one-quarter is cultivated, and one-fifth is idle. Only a very small part is in pasture. The wooded areas have good stands of maple, beech, white pine, hemlock, and birch. Potatoes, corn, and oats are the main crops.

The soil is well suited to all the crops of the area, but because it is strongly acid, heavy applications of lime are needed for crops such as peas or alfalfa. Good yields also require heavy applications of nitrogen and complete fertilizer.

Sweden stony loam, 0 to 12 percent slopes (Sc; group 12).—The following is a representative profile:

Surface soil—
Several thin layers, each 1 to 2 inches thick: (1) loose leaves and twigs overlying thin mat of well-decomposed humus, together 2 to 3 inches thick; (2) 1 to 2 inches of very dark gray, very friable, extremely acid stony loam; weak medium granular structure; (3) stony loam abruptly overlying light-gray or

brownish-gray, extremely acid, very friable sandy loam or loam; structureless; entire thickness of surface soil may be 5 to 6 inches.

Subsoil—

Dark reddish-brown, very strongly acid, firm loam; weak fine subangular blocky structure; firm loam grades into very friable yellowish-brown loam or fine sandy loam; weak fine subangular structure; subsoil is then transitional to friable, yellowish-brown, strongly acid fine sandy loam or loam that continues to a depth of 24 inches, where it abruptly overlies the substratum.

Substratum—

Yellowish-red, strongly acid, clay loam; very firm (hard when dry); weak medium subangular blocky structure; channers of greenish fine-grained sandstone numerous; at depth of 34 inches substratum grades into red, strongly acid channery clay loam; extremely firm (very hard when dry); strong medium to coarse subangular structure (in some areas structure may be thick platy); average depth to bedrock about 4 feet, but depths may range from 3 to 7 feet or more.

The permeability of the soil to water is moderately rapid.

Use and management.—Almost all of this soil is wooded. About one-tenth has been cleared, but most of this is idle. Less than 1 percent is in orchards. Forests consist mainly of red and sugar maples, beech, white pine, hemlock, and birch. When the soil is cleared and heavily limed and fertilized it is suitable for the crops commonly grown in the area.

Tioga Series

The well-drained, deep Tioga soils of the bottom lands are on mixed alluvium. This alluvium was derived from gray sandstone and siltstone of the Pocono, Pottsville, and Chemung formations. Long, narrow areas of these soils occur along most of the large streams in the county. In these areas they are associated with moderately well drained Middlebury, poorly drained Holly, and very poorly drained Papakating soils.

Tioga fine sandy loam, 0 to 3 percent slopes (Ta; group 4A).—The following is a representative profile:

Surface soil—

Brown, dark-brown, or strong-brown, very friable to firm, strongly acid, fine sandy loam; structureless; layer may be 11 to 14 inches thick.

Subsoil—

Yellowish-brown, slightly firm, strongly acid loamy fine sand; structureless; layer extends to depth of almost 24 inches.

Substratum—

Dark yellowish-brown fine sand that in some places may be streaked with red; very firm but brittle; medium to strongly acid fine sand abruptly overlies stratified sand and gravel at an average depth of 4 feet or more; depths to hard material may range from 3 to 10 feet or more.

The permeability of the soil to water is rapid.

The profile varies from place to place, mainly in the depth to gravel, amount of reddish material in the lower substratum, and sandiness of the substratum. Instead of sand and gravel, the substratum may be loam, sandy loam, or very fine sandy loam. Some natural levees that are mainly loamy sand are also included with this soil. These loamy sand areas are more droughty than those of the fine sandy loam, but they are too small to affect crop use.

Use and management.—Most of Tioga fine sandy loam, 0 to 3 percent slopes, is cleared and about equally divided as idle land, pasture, and cultivated land. Even though it is flooded almost every year, floods normally occur in spring when the weather is too cold for crops. Crops can be grown the rest of the year. The soil is suited to most of the crops of the area, but it is too low for apples. Adequate amounts of lime and of nitrogen and other fertilizer are needed for good yields. A small part of this soil in the State forests in the southern part of the county has stands of willow, sycamore, beech, and elm.

Tioga fine sandy loam, high bottom phase, 0 to 3 percent slopes (Tb; group 4A).—This soil is similar to Tioga fine sandy loam, 0 to 3 percent slopes, except for its position on young terraces that overflow only during periods of very high water. Isolated areas of this soil on a farm west of Roulette are 4 to 5 feet higher than the normal bottom land.

This soil is scattered along the generally wider bottom lands of the major streams in the central and northern parts of the county. It is usually discontinuous and is often the remanents of older levees. The soil is similar to Tioga fine sandy loam, 0 to 3 percent slopes, but depth to gravel is normally greater and the substratum may be slightly mottled.

Use and management.—About half of this soil is cultivated or in pasture, and most of the rest is urban land. Only a small part is in forest. The soil is well suited to all the crops of the area but requires heavy applications of lime, nitrogen, and complete fertilizer.

Tioga gravelly loam, 0 to 3 percent slopes (Tc; group 4A).—Except that its material is much coarser and is very rapidly permeable, this soil is similar to Tioga fine sandy loam, 0 to 3 percent slopes. Gravelly spots and streaks are common throughout this soil. The soil mainly occurs next to recent stream bypasses or active stream channels. In some places the soil resembles Riverwash except that it has good cover. Generally the pebbles average about 2 inches in diameter, but some coarse sands and some cobbles as large as 5 to 6 inches across also occur. Like Tioga fine sandy loam, 0 to 3 percent slopes, this soil is flooded periodically, but drainage is more rapid.

Use and management.—This soil is about equally divided as cropland, pasture, forest, and idle land, and urban land. For good yields the soil requires heavy initial applications of lime, complete fertilizer, and manure. Because of excessive internal drainage, vegetables also require irrigation, at least for part of the summer. The forest consists of good stands of mixed white pine, beech, sycamore, elm, and some poplar.

Tunkhannock Series

The well-drained, very deep Tunkhannock soils occur mostly on cobbly and gravelly glaciofluvial terraces. They also occur on stream fans that contain much coarse rubble, and many channers, flagstones, and large slabs, mainly of the Catskill formation. These fans or colluvial deposits are generally in the southern part of

the county at the mouths of steeply pitched streams that are entrenching in the Allegheny Plateau. At times the streams bring down coarse rubble during flash floods, but most of the time they stay within their channels. Several feet of colluvium may be on the stream bottoms.

Most Tunkhannock soils are on nearly level or sloping glaciofluvial terraces that have steep escarpments. These terraces contain sand and gravel that was deposited by glacial streams. The deposits were derived largely from reddish shale and sandstone of the Catskill formation but include pebbles and cobbles of igneous granite and metamorphic gneiss that were derived from glacial drift. The Tunkhannock soils of the terraces resemble the Chenango soils also of the glaciofluvial terraces but differ in being redder and more flaggy and channery. They also resemble the Germania soils on older terraces in the valleys of Sinnemahoning Creek and Kettle Creek, except that they are browner and darker in the subsoil and generally coarser and more open and porous.

The Tunkhannock soils occur in association with and on material similar to that of the moderately well drained Braceville and poorly drained Red Hook soils. The Tunkhannock soils on terraces are most common in the stream valleys of the central and northern part of the county near Bingham Center, Oswayo, Genesee, and Honeoye, and along the valleys of Fishing Creek and Sartwell Creek.

Tunkhannock flaggy loam, 3 to 20 percent slopes (Td; group 12).—The following is a representative profile:

Surface soil—
Loose, brown, extremely acid mixture of twigs and leaves about 2 inches thick; then 1 to 2 inches of very dark brown, very friable flaggy loam of weak medium granular structure; flaggy loam abruptly overlies light reddish-brown or pinkish-gray flaggy very fine sandy loam or flaggy loam; extremely acid layer; loose and structureless; continues to depths of 3 to 4 inches.

Subsoil—
Yellowish-red to brown or reddish-brown, very strongly acid, loose flaggy loam; weak fine granular structure; contains very many flagstones of Catskill formation; layer may extend to depth of 32 inches.

Substratum—
Reddish-brown, strongly acid very flaggy sandy loam that becomes extremely flaggy or slabby with depth; loose and structureless; average depth to bedrock about 6 feet, but depths may range from 4 to 30 feet.

The permeability of the soil to water is very rapid.

Use and management.—Almost all of this soil is wooded, and most of the few cleared areas are idle or in pasture. The forests have good stands of beech, apple, hemlock, and some white pine and oak. Some of the finer textured areas and those areas included in fields with better soils may be suited to berries and most other crops of the county. If the soil is cleared, it is best suited to small grains, potatoes, corn, beans, apples, and berries. Generally the soil is much too coarse for cultivation and should be kept in forest.

Tunkhannock flaggy loam, 20 to 30 percent slopes (Te; group 11A).—This soil is similar to Tunkhannock flaggy loam, 3 to 20 percent slopes, but it occurs in the southern part of the county in narrow valleys where streams are cutting away the plateau. Most of the soil is wooded, but small acreages are cultivated, used for pasture, or left idle.

Tunkhannock flaggy loam, 30 to 50 percent slopes (Tf; group 14A).—This soil occurs on the steep escarpments of terraces that are underlain by alluvium and colluvium. Fundamentally it is similar to other Tunkhannock flaggy loams and to the Tunkhannock gravelly loams. Almost two-thirds of the soil has been cleared. Most of this is in pasture, but a large part is idle. About one-fourth is wooded. A few steep areas that occur with the generally level terraces or the sloping colluvial land are cultivated. These areas are erodible and should be protected by strips of sod. This soil is generally too steep for cultivation.

Tunkhannock gravelly loam, 0 to 12 percent slopes (Tg; group 1).—An area of this soil on a farm near Coudersport is shown in figure 7.

Representative profile:

Surface soil—
Brown to strong-brown, very friable, strongly acid gravelly loam; weak medium granular structure; depth of surface soil ranges from 5 to 12 inches; depth depends on whether material accumulated on surface.

Subsoil—
Reddish-yellow to reddish-brown, strongly acid, moderately loose to friable gravelly loam; weak coarse irregular granular structure; layer may extend to depth of 33 inches.

Substratum—
Reddish-brown to dark reddish-brown, strongly acid, coarse and medium gravelly loam; loose and structureless; gravelly loam grades into stratified and rounded fragments of rock derived from reddish and greenish sandstone and siltstone of the Catskill formation; average diameter of fragments is about 2 inches, but diameters range from ½ to 4 inches; average depth of soil to bedrock about 10 feet, but depths range from 6 to 30 feet.

The permeability of the soil to water is rapid.

The color of this soil may range from red to brown. In a few places the surface layer is so brown that the soil resembles the Chenango soils, which are yellow and brown and are on glaciofluvial deposits. All of the Tunkhannock soils, however, are red in the substratum, and most of their gravel is somewhat coarse at depths of 4 to 5 feet.

Use and management.—More than one-third of this soil is cultivated, one-fifth is idle, and one-tenth is in pasture. Most of the rest is wooded. Corn, potatoes, and other crops of the area are grown. The forests contain oak, pine, hickory, and other hardwoods. Formerly, pure stands of white pine grew in some areas.

The soil is naturally low in plant nutrients and needs heavy applications of complete fertilizer and manure for good yields. Much lime is also needed for all crops except potatoes, strawberries, and similar acid-tolerant crops.

Tunkhannock soils, however, are red in the substratum, (Th; group 5).—This sloping soil is mainly on old stream fans that are geographically associated with the glaciofluvial terraces. It occurs primarily in the central part of the county where the glacial melt water flowed down the comparatively short stream valleys. This soil is erodible and, when cultivated, requires stripcropping and contour cultivation. Suggested use

and fertilization are about the same as for Tunkhannock gravelly loam, 0 to 12 percent slopes. Included in this mapping unit are crests of terrace escarpments on slopes similar to those of this soil. These crests occur most frequently near uplands as the cutbanks of streams.

Unadilla Series

The well-drained, deep Unadilla soils of the stream terraces occur mainly on sandy and fine gravelly alluvium of the Pocono, Pottsville, and Chemung formations. The soils are situated along all main streams of the county where the bottom land is wide enough for terraces to form. Unadilla soils occur in association with the Tioga soils of the bottom lands. They also occur with the moderately well drained Scio and the poorly drained Red Hook soils that also occur on terraces.

Unadilla fine sandy loam, 0 to 3 percent slopes (Ua; group 1).—This soil resembles Tioga fine sandy loam, 0 to 3 percent slopes, but unlike the bottom-land Tioga it is rarely flooded. This Unadilla soil is covered only when water is exceptionally high. The soil also closely resembles the high bottom phase of Tioga fine sandy loam, and in places the two soils are identical in profile to depths of 2 to 3 feet. At these depths, most of the Unadilla fine sandy loam in this county overlies compact or heavy material, but the lower soils on the bottom land grade into loose and frequently wet sand and gravel. A thin bleicherde, or leached, layer occurs in the Unadilla soil, but not in the Tioga.

Representative profile:

Surface soil—
Dark-brown to strong-brown, very strongly acid, very friable fine sandy loam; weak fine granular structure; layer may be as deep as 8 inches.

Subsoil—
Yellowish-brown, strongly acid, friable to firm fine sandy loam that may include a few pebbles; weak fine to medium subangular blocky or thick platy structure; layer may extend to depth of 24 inches.

Substratum—
Brownish-yellow, strongly acid sandy clay loam that may contain a few small pebbles; firm to very firm (somewhat compact); sandy clay loam grades into more or less compact, stratified sand and gravel that may contain lenses of clay or silt; average depth to hard material 6 feet or more but depths may range from 5 to 20 feet.

The permeability of the soil to water is rapid.

Use and management.—Almost half of this soil is urban land, and almost one-quarter is cultivated. The northern part of Roulette is built on this soil. Less than one-fifth of the soil is wooded, and the rest is in pasture or idle. Formerly some pure stands of white pine grew in the northern valleys, but today mixed pine and hardwoods occupy the wooded areas. This soil is recognized as the cornland of the county. Corn is grown in rotation with oats, some potatoes or beans, and clover or mixed clover and timothy hay.

The soil is well suited to all crops of the area, but, because of poor air drainage, it is not well suited to orchards. For good yields the soil needs heavy applications of complete fertilizer and manure and moderately heavy applications of lime. It normally has satisfactory moisture relations and, unlike other gravelly and sandy soils of the terraces and bottom lands, does not require irrigation.

Unadilla silt loam, 0 to 3 percent slopes (Ub; group 1).—This strongly acid soil is similar to Unadilla fine sandy loam, 0 to 3 percent slopes. It occurs mainly in the northeastern part of the county in places where the alluvium includes more rocks from Chemung formation than normal and where the dark Volusia soils are extensive. The silt loam therefore is generally darker and tends to be slightly less well drained than Unadilla fine sandy loam.

Representative profile:

Surface soil—
Dark-brown, strongly acid, very friable silt loam; weak fine granular structure; layer about 8 inches thick.

Subsoil—
Pale-brown to yellowish-brown or light yellowish-brown, strongly acid, friable to firm silt loam; moderately weak coarse granular or fine subangular blocky structure; layer extends to depths of about 30 inches.

Substratum—
Light yellowish-brown, moderately firm, medium acid fine sandy clay of weak to moderately strong coarse subangular blocky structure; sandy clay grades into stratified sand and gravel that in many places includes lenses of clay or silt; depths to hard material about 6 feet but depths may range from 5 to 20 feet.

The permeability of the soil to water is moderately rapid.

Use and management.—Two-thirds of this soil is in crops and about one-fourth in pasture. The rest is idle, wooded, or in urban development. The soil is well suited to most crops of the area except orchard crops and potatoes. It has insufficient air drainage for orchards and is generally too fine for potatoes. But this is a leading soil for corn and pastures. Yields of corn and other grains are large, and pastures are of high quality. For good yields the soil needs substantial applications of complete fertilizer and moderately heavy applications of lime.

Volusia Series

The very deep, poorly drained Volusia soils of the uplands are on thick glacial till and frost-worked deposits that include much fossiliferous rock of the Chemung formation. The soils are mostly in the extreme northeastern and northwestern corners of the county.

Volusia soils occur in association primarily with and on materials similar to those of the moderately well drained Mardin and very poorly drained Chippewa soils. They are also associated with the well-drained Bath and the somewhat excessively drained Woostern soils. The Volusia soils resemble the Armagh and Brinkerton soils but are generally grayer and much less acid in the substratum.

Volusia channery silt loam, 0 to 3 percent slopes (Va; group 8A).—The following is a representative profile:

Surface soil—
Dark-gray, strongly acid, friable silt loam 5 to 7 inches thick; strong medium granular structure; (in places silt loam grades into grayish-brown, strongly acid,

firm channery silt loam of strong medium platy structure that may extend to a depth of 12 inches or more.)

Subsoil—

Mottled yellow and gray strongly acid silty clay loam; plastic and sticky when wet; strong thick platy structure; layer may extend as deep as 18 inches.

Substratum—

Extremely mottled gray and yellow, with some brown, strongly to medium acid, very hard and compact channery clay loam; strong coarse subangular blocky structure; at depth of 40 inches clay loam grades into mottled and streaked gray, brown, and yellow, medium acid channery silty clay loam that is very plastic and sticky when wet (extremely hard when dry); strong coarse subangular blocky structure (in some places substratum is massive and forms large clods when dug up); average depth to bedrock about 6 feet, but depths may range from 5 to 15 feet or more.

The permeability of the soil to water is very slow.

Immediately north of Mills the glacial till below this Volusia channery silt loam is slightly acid at depths of 6 to 7 feet. In other places this till may be neutral to slightly acid below depths of 7 feet.

Use and management.—About one-third of this soil is in pasture, and slightly smaller acreages are cultivated or wooded. One-tenth is idle. The forests consist of hemlock, birch, beech, and maple. The soil is well suited to clover and timothy hay, and to oats and other grains except corn. Because of poor drainage, corn, potatoes, other row crops, and orchards do not do well on this soil.

For best yields the soils require diversion terraces and tile drains. Even pastures will often benefit from drainage. Moderate applications of lime and nitrogen and heavy applications of phosphate and potassium are also required for good yields. The soils frequently occur on dairy or livestock farms where enough manure is available. They can be greatly improved, and if they are adequately drained, some row crops can be grown.

Volusia channery silt loam, 3 to 8 percent slopes (Vb; group 8A).—This soil occurs on gently sloping and undulating areas that are common in the wide shallow valleys where Volusia soils prevail. Although internal drainage is the same as for Volusia channery silt loam, 0 to 3 percent slopes, external drainage is greater. The soil therefore erodes more readily and if cultivated requires contour tillage to control runoff, and in some places, diversion terraces. This gently sloping soil is slightly better suited to corn and other grains than Volusia channery silt loam, 0 to 3 percent slopes.

Volusia channery silt loam, 8 to 15 percent slopes (Vc; group 8A).—This sloping soil is similar to Volusia channery silt loam, 3 to 8 percent slopes, but the greater slopes cause more rapid runoff. Because the soil does not absorb rainfall readily, it is subject to severe sheet erosion if cultivated to row crops. Most of the soil, however, is pastured or in small grains. A few areas include patches that are slightly better drained internally than the typical soil. These areas are used for orchards, pasture, and grain. The orchard trees, however, are mostly winterkilled or injured because of insufficient internal drainage.

Volusia channery silt loam, 15 to 25 percent slopes (Vd; group 10A).—This moderately steep soil is similar to the less sloping Volusia channery silt loams. But its greater slopes cause greater runoff, and sheet erosion is very active. Even some pastures are affected and require diversion terraces to control runoff. None of the soil is cultivated to row crops, but some less steep spots that have slightly better drainage than normal have poor orchards or fairly good stands of oats. This soil is well suited to pasture or hay and is mostly used for them. About one-fifth of the soil remains in forest that contains hemlock, maple, and poplar or birch.

Volusia channery silt loam, 25 to 40 percent slopes (Ve; group 14B).—This soil unit includes Volusia channery silt loam and Volusia flaggy silt loam, but the use of almost all of the unit is the same. More than half of this unit is wooded and almost one-quarter is in pasture or hay. The rest is idle. The wooded areas contain mainly hemlock and some maple, birch, and beech. The unit is similar to the less strongly sloping Volusia channery silt loams, but the steep slopes restrict cultivation. About 6 percent of this steep unit is used for small grains and a few orchards. It is best suited to pasture, which can be improved by drainage, heavy applications of phosphorus and potassium, and moderate applications of lime and nitrogen or manure.

Volusia flaggy silt loam, 0 to 8 percent slopes (Vf; group 8B).—This soil resembles Volusia channery silt loam, 0 to 3 percent slopes, but occupies slopes that are generally more sloping. Furthermore, it occurs more often than the channery silt loam along the upper sides of valleys and along bases of these sides where taluslike materials have accumulated. It is also more widespread than Volusia channery silt loam, 0 to 3 percent slopes.

The soil frequently occurs in association with the stony and flaggy soils of the Lordstown and Mardin series. All of this soil is in the northern part of the county, mostly in the northeast. Flagstones normally 6 to 7 inches wide and 15 to 20 inches long are scattered over the surface of the soil. Only a few of these flagstones are more than 3 to 5 inches thick. They are mainly gray, fine-grained sandstone of the Pocono and Chemung formations. The soil frequently contains fossiliferous fragments of the Chemung formation.

Representative profile:

Surface soil—

Dark-gray, very strongly to strongly acid flaggy silt loam; friable (slightly sticky and plastic when wet); strong medium granular structure; layer grades into grayish-brown, firm, silt loam of strong coarse granular structure and continues to depth of 12 inches.

Subsoil—

Intensely mottled gray, brown, and yellow, strongly acid flaggy clay loam to a depth of 42 inches; very firm (very hard when dry, sticky and very plastic when wet); strong thick platy structure; at 42 inches mottled gray and yellow, medium acid, glacial till of flaggy clay loam occurs; extremely hard (very sticky and very plastic when wet); strong coarse to medium subangular blocky structure; average depth to bedrock about 5 feet but depths range from 4 to 12 feet; bedrock normally fossiliferous siltstone of the Chemung formation that is horizontally bedded.

The permeability of the soil to water is slow.

Included with this soil are small spots near drainage channels and on small knolls that are less mottled

in the subsoil and more yellow in the substratum than the typical soil. These small spots are similar to the Mardin soils in crop response, but they have the poor drainage and stickiness characteristic of Volusia soils.

Use and management.—Half of the Volusia flaggy silt loam, 0 to 8 percent slopes, has a second growth of beech, birch, maple, and hemlock. About one-fifth is in pasture, and an equal amount is idle. Only about 8 percent is planted to small grains. The soil is not suited to row crops or orchards. If it is used for crops, especially beans and corn, artificial drainage is required. Lime and complete fertilizer are also needed for good yields. The soil is much better suited to pasture and hay than to small grains.

Volusia flaggy silt loam, 8 to 15 percent slopes (Vg; group 8B).—Almost half of this soil is wooded, and the rest is pastured or idle. The wooded areas have fair stands of hemlock, maple, and beech. Because of the hazard of severe sheet erosion, and because flagstones are even more numerous than on the less sloping areas of Volusia flaggy silt loam, this soil normally is not cultivated.

Volusia flaggy silt loam, 15 to 25 percent slopes (Vh; group 10B).—Almost half of this soil contains good stands of hemlock and maple and some beech and poplar. About one-third is in pasture or hay. Some oats and buckwheat are grown in a few of the less strongly sloping areas.

This soil is entirely too flaggy and susceptible to sheet erosion to be used for row crops. Even some of the pastures and hayfields show signs of erosion, and in these areas diversion terraces should be constructed to help control runoff.

Vrooman Series

The well-drained, very deep Vrooman soils of the stream terraces occur mainly on sandy and fine gravelly alluvium from the Catskill formation. These soils are along all the streams of the county where the bottom lands are wide enough for terraces to form. They are associated with the Barbour soils of the flood plains. They resemble the Barbour soils in color and other characteristics but are not flooded so frequently. Vrooman soils occur in association with the moderately well drained Scio and the poorly drained Red Hook soils on the terraces.

Vrooman fine sandy loam, 0 to 3 percent slopes (Vk; group 1).—Except for color, this soil is similar to Unadilla fine sandy loam, 0 to 3 percent slopes.

Representative profile:

Surface soil—
Dark-brown to reddish-brown, strongly acid, very friable fine sandy loam; weak medium granular structure; layer may be as thin as 4 inches but normally is about 10 inches thick.

Subsoil—
Brownish-red, very strongly acid, friable fine sandy loam; weak coarse irregular granular structure; layer extends to depth of almost 34 inches.

Substratum—
Light brownish-red, very strongly acid, very friable (slightly compact) loamy fine sand; normally very weak thick platy structure; (in some places upper substratum is structureless) loamy fine sand abruptly transitional to light reddish-brown, strongly acid loose sand and gravel; average depth to hard material about 8 feet, but depths may range from 6 to 20 feet or more.

The permeability of the soil to water is rapid.

Use and management.—More than half of this soil is cultivated, one-fifth is idle, and about one-tenth is in farm and urban developments. About one-eighth is in pasture, and a smaller part is wooded. The principal crops are corn, potatoes, beans, peas, and small grains. The small grains are grown in rotation with clover or clover-and-timothy hay. Heavy applications of lime, nitrogen, complete fertilizer, and manure are needed for good yields, but the soil is very responsive, and exceptionally large crops are often produced. The wooded areas have excellent stands of white pine and hardwoods.

Vrooman silt loam, 0 to 3 percent slopes (Vm; group 1).—This soil is similar to Vrooman fine sandy loam, 0 to 3 percent slopes, but it is normally less acid, finer textured, and darker colored in the surface soil. Furthermore it occurs more frequently in certain southern and central valleys where the soils of the uplands are primarily from Catskill shale and siltstone. This soil occurs in association with the Scio and Red Hook soils on the present stream terraces and to a less extent with Tunkhannock soils in places where the glaciofluvial terraces occur next to the present stream terraces.

This soil occupies small terraces that include gently sloping fans of materials finer than those that normally occur in Tunkhannock gravelly loam, 12 to 20 percent slopes.

Representative profile:

Surface soil—
Dark-brown, medium acid, very friable silt loam; strong medium granular structure; layer may be 8 inches thick.

Subsoil—
Dark reddish-brown, strongly acid, friable silt loam of moderately strong medium platy structure; extends to depth of 10 inches; at this depth subsoil is brownish-red, strongly acid, friable silt loam of weak coarse irregular granular structure; in some places subsoil contains lenses of clay or silt; subsoil extends to depth of about 20 inches.

Substratum—
Reddish-brown, very strongly acid, very friable very fine sandy loam; weak thin to medium platy structure that disappears with depth; fine sandy loam abruptly overlies light brownish-red stratified sands and gravel; (in some places the medium-textured materials extend to a considerable depth and contain silty and fine sand streaks); average depth to hard material about 8 feet, but depths may range from 6 to 20 feet or more.

The permeability of the soil to water is moderately rapid.

Use and management.—Two-thirds of this soil is cultivated, and almost one-fifth is wooded. The rest is idle or in pasture. The forests contain maple, ash, elm, white pine, and some butternut and walnut. The principal crops are corn and small grains, particularly oats. Some wheat, barley, and rye are grown. Applications of lime, manure, complete fertilizer, and nitrogen normally result in good yields, and in some years yields are exceptionally high. The soil is well suited to almost all the crops of the area except apples.

Apples require better air drainage than that of the soils on the stream terraces.

Wellsboro Series

The deep and very deep, moderately well drained Wellsboro soils of the uplands occur in the northeastern part of the county on glacial till and in other parts on frost-worked deposits. These deposits contain channers and flagstones of red and green sandstone and siltstone of the Catskill formation.

The Wellsboro soils occur in association with and on materials similar to those of deep, well-drained Lackawanna, the shallow Oquaga, and the poorly drained Morris soils. Large areas occur in the vicinity of Hector, Borie, North Bingham, and Germania. The Wellsboro soils are also in areas transitional to the browner Cattaraugus and Culvers soils. They resemble the Culvers soils but are redder and more firm in the substratum.

Wellsboro channery silt loam, 0 to 8 percent slopes (Wa; group 3).—The following is a representative profile:

Surface soil—
Dark reddish-gray to red, strongly acid, very friable to friable channery silt loam; moderately strong fine granular structure; layer 5 to 6 inches thick.

Subsoil—
Weak-red, firm and brittle, very strongly acid, silt loam; weak fine subangular blocky structure; silt loam extends to depth of 22 inches and grades into mottled weak-red and reddish-brown, very firm, medium or strongly acid fine sandy clay loam that in places has a strong thick platy structure; in other places structure is medium subangular blocky; subsoil may be as deep as 28 inches.

Substratum—
Mottled red and light reddish-brown, medium acid, very firm fine sandy clay loam; strong thick platy structure; at depth of 42 inches layer grades into slightly mottled weak-red and reddish-brown, medium acid, very firm sandy clay loam; weak medium subangular blocky structure; fine sandy clay loam grades into compact glacial till or frost-worked deposits that are very hard when dry; average depth to bedrock about 6 feet but depths may range from 4 to 20 feet or more.

The permeability of the soil to water is moderately slow.

Included with this soil are small areas of loam, a few areas of very fine sandy loam, and some flaggy areas. These areas are not large enough to be shown separately or to be included with Wellsboro stony loam. Small spots of Culvers and Morris soils are also included. The Wellsboro channery silt loam in the southern part of the county on frost-worked deposits is not so red as that in the north on glacial till.

Use and management.—Almost half of the Wellsboro channery silt loam, 0 to 8 percent slopes, is wooded. More than one-third is cultivated, and the rest is idle or in pasture. The forests consist of white pine, oak, maple, hickory, and beech.

This soil is one of the most productive in the county for hay, grain, corn, potatoes, and beans. It is not so well suited to peas, orchard fruits, or alfalfa. Orchards that are properly located, however, may give good yields, and peas and alfalfa may do well if diversion terraces are constructed on the best parts of the soil. The diversion terraces will keep some of the excess water from the soil. The soil is low in nitrogen and moderately low in other plant nutrients and lime. Moderately heavy applications of lime and heavy applications of complete fertilizer and manure are needed for high yields.

Wellsboro channery silt loam, 8 to 15 percent slopes (Wb; group 6).—This soil occurs on the lower sides of valleys and in sloping interstream areas. When it is cultivated, the risk of sheet erosion requires that suitable practices be carried out to prevent erosion. Contour tillage, stripcropping, and, in some places, diversion terraces help keep this soil productive. Because external drainage is better than it is on Wellsboro channery silt loam, 0 to 8 percent slopes, this soil is more suited to apples. It is also suited to most of the crops of the county, but it should be drained for peas and other crops that require well-drained soils.

Wellsboro channery silt loam, 15 to 25 percent slopes (Wc; group 11A).—This soil occurs on sides of the valleys. Externally the soil is well drained because of the steeper slopes, but internal drainage is the same as for the less sloping Wellsboro channery silt loams. If the soil is cultivated, it requires many practices for erosion control—stripcropping, contour tillage, cover crops, long rotations, and, in places, diversion terraces.

More than half of this soil is wooded. The rest is about equally divided as cultivated, pastured, and idle land. The soil is best suited to pasture, hay, and small grains.

Wellsboro channery silt loam, 25 to 35 percent slopes (Wd; group 13B).—About half of this soil is forested, one-quarter pastured, and the rest idle or in crops. The slopes are too steep for adequate erosion control on cultivated soil. Because of seepage and springs along the slopes, most areas are too wet for potatoes and peas. The soil is best suited to pastures, hay, or small grains. Lime and fertilizer requirements are the same as for the less steep areas of Wellsboro channery silt loam.

Wellsboro stony loam, 0 to 15 percent slopes (We; group 12).—This upland soil is similar to the Wellsboro channery silt loams of similar slopes, except for stoniness and texture. It occurs mainly in the wooded sections or woodlots of the south and west-central parts of the county. The soil normally occurs in small irregular tracts around the headwaters of streams, along valley walls, and in interstream areas.

Representative profile:

Surface soil—
Very dark brown forest litter about 2 inches thick (in some places is compact and well rotted); about 2 inches of very dark brown, friable loam; strong medium granular structure; friable loam abruptly overlies pale-brown or light brownish-gray, very friable loam; weak fine granular structure; mineral soil may be 5 to 6 inches thick; entire surface soil very strongly acid; soil may be stained dark brown along plant roots.

Subsoil—
Dark-red to purplish-red, very strongly acid, firm to friable flaggy loam; moderately strong medium platy structure; flaggy loam extends to depth of about 19 inches where it is mottled yellowish-red and gray or brown, strongly acid silty clay loam or loam; plastic (hard when dry); contains many reddish fragments;

strong thick platy structure; subsoil may extend as deep as 32 inches.

Substratum—

Moderately mottled, purplish-red and purplish-gray, firm, strongly acid flaggy loam frost-worked deposits; strong medium subangular blocky structure.

Spots of soil that are sandier, deeper, and better drained than the typical soil are included. The wooded areas, particularly, contain small spots of soils other than those of the Wellsboro series. On some benches at the headwaters of streams, the areas are actually complexes of Wellsboro and Morris soils.

Use and management.—More than half of Wellsboro stony loam, 0 to 15 percent slopes, has good stands of hemlock, maple, birch, beech, and some white pine. Almost half is in unimproved pastures that have stones, flagstones, and boulders scattered over the surface. These pastures could be improved by clearing and draining or by constructing diversion terraces. Heavy applications of lime, nitrogen, and phosphorus will also improve these pastures. The soil could also be cleared for crops. Suggested management is the same as for the Wellsboro channery silt loams of similar slopes.

Wellsboro stony loam, 15 to 25 percent slopes (Wf; group 13A).—This soil occurs on moderately steep lower valley walls and ridge crests where Wellsboro soils prevail. Because of steeper slopes, runoff is greater than for Wellsboro stony loam, 0 to 15 percent slopes, but internal drainage is the same.

Almost all of this soil is wooded, and less than one-tenth in pasture. None of it is in crops. The wooded areas have good stands of mixed northern hardwoods and softwoods, mainly maple, birch, beech, hemlock, and some white pine.

The soil is best suited to pasture, small grains, and hay. With drainage or diversion terraces, it is also suited to other crops, but erosion control is needed for cultivated crops.

Wellsboro stony loam, 25 to 35 percent slopes (Wg; group 13A).—This soil occurs on the valley walls and along streambanks. It is practically all wooded with the same type of trees as is on Wellsboro stony loam, 15 to 25 percent slopes. None of this steep soil is cultivated. About 2 percent is in pasture or idle.

Wharton Series

The deep, moderately well drained but slowly permeable Wharton soils of the uplands occur on interbedded shale and sandstone of the Pocono formation. They may also occur on residuum derived from yellow or gray shale and sandstone of other formations, but in Potter County the shale is normally dark brown. These soils are on the highest ridges of the southern and central parts of the county and extend northward at the highest elevations into the glaciated area.

The soils are in small and scattered areas. They normally occur in association with poorly drained Brinkerton and Armagh and very poorly drained Chippewa soils. In the northern part of the county they occur next to Lordstown and other thinly glaciated soils. In the southern part they are adjacent to the yellow Bath and Mardin soils on frost-worked materials. Wharton soils resemble the Clymer soils but have much finer texture in the solum. Normally, depths to weathered rock ledges are 3 to 4 feet, but these rock ledges frequently occur within the profile.

Wharton channery silt loam, 0 to 12 percent slopes (Wh; group 3).—The following is a representative profile:

Surface soil—

Normally two or three layers: (1) dark-brown forest detritus about 2 inches thick; (2) light grayish-brown 3- to 4-inch layer of extremely acid, friable loam; weak medium structure; pale-brown, extremely acid, firm silt loam with many tiny shale fragments; strong medium subangular blocky structure; surface soil may extend to depths of 10 inches below surface.

Subsoil—

Light yellowish-brown to yellowish-brown, strongly acid silty clay loam to clay loam or shaly clay loam; hard or plastic; strong medium subangular blocky structure in upper part, and thick platy structure in lower part; subsoil may extend as deep as 30 inches.

Substratum—

Light to medium yellowish-brown shaly clay or clay loam slightly discolored in places with gray and brown; hard or plastic; strongly acid; structure varies from strong thick platy to irregular subangular blocky; substratum grades at average depth of 3 feet into interbedded shale and fine-grained sandstone or siltstone of the Pocono formation; range in depth to bedrock may be from 2 to 6 feet.

The permeability of the soil to water is slow or moderately slow.

Use and management.—Practically all of this soil is wooded. A small part is in crops, and even less in pasture. The forests have thin stands of oak, beech, maple, black cherry, hemlock, and some birch. Tall grasses and weeds form a pronounced understory. The cultivated acreage is in small grains.

The soil is best suited to pastures, small grains, some cane fruits or other berries, and hay. The fine texture of the soil hinders cultivation, and the moderately slow permeability prevents artificial drainage from becoming effective. The soil therefore is poorly suited to row crops and entirely unsuited to apples and root vegetables. Because the soil is mostly wooded, it is best to maintain the forest and clear other soils that are more suited to crops.

Wharton channery silt loam, 12 to 20 percent slopes (Wk; group 6).—This soil occurs on long slopes of the Allegheny Plateau where Wharton soils prevail. Because of greater slope, runoff is more rapid on this soil than on Wharton channery silt loam, 0 to 12 percent slopes. Accelerated erosion is therefore often severe, even on pastures and some sparse woodland. Almost all of this sloping soil is and should remain in forest.

Wharton channery silt loam, 20 to 30 percent slopes (Wm; group 11A).—This soil occurs mainly at the break between the top of the Allegheny Plateau and the steep valley sides. It is practically all wooded and should be kept in forests. If cleared for crops, this soil would erode readily.

Woostern Series

The well-drained, very deep Woostern soils of the uplands occur on loose bouldery and gravelly glacial

till or a mixture of outwash and till. The underlying material is quite porous and sandy in some places and compact in others, but in no place is it compact enough to impede drainage. Woostern soils are not extensive. They occur mainly as deposits in valleys in the northern part of the county near the border of the Wisconsin drift. Large areas are near Genesee, Honeoye, Gold, Andrews Settlement, and West Pike.

Woostern soils occur in association mainly with Mardin soils. Mardin soils, as mapped in Potter County, include gravelly and bouldery areas similar to those of Woostern soils except for drainage and color. Woostern soils also occur adjacent to glaciofluvial terraces that are occupied by Chenango and Tunkhannock soils. They are less frequently associated with the Cattaraugus and Lackawanna soils on well-drained drift.

Woostern gravelly loam, 0 to 12 percent slopes (Wn; group 1).—The following is a representative profile:

Surface soil—
Dark grayish-brown to very dark brown, extremely to very strongly acid, gravelly loam or fine sandy loam; friable to loose; generally structureless; layer normally 5 to 6 inches thick.

Subsoil—
Yellowish-brown to brownish-yellow, strongly acid, moderately loose gravelly loam (includes some firm thin layers); layer generally structureless and may be loamy sand in small pockets; subsoil normally extends to depth of about 40 inches.

Substratum—
Pale yellowish-gray or pale-brown, generally friable to firm, strongly acid, gravelly or bouldery glacial till; in places may contain spots of sandy clay; dark-brown stains often occur around roots and root channels that penetrate deep in the substratum; may be friable, firm, or compact; most deposits at depths of 7 to 8 feet are less acid and generally sandier than the surface soil; depth to bedrock normally 10 feet or more, but depths may range from 6 to 40 feet or more.

The permeability of the soil to water is very rapid.

Included are spots of stony or bouldery till. Small kettle holes also occur, and these are less well drained than normal for the soil.

Use and management.—Almost half of Woostern gravelly loam, 0 to 12 percent slopes, is in crops, among which are grain grown in rotation with hay. About one-quarter has stands of beech, maple, white pine, and some oak. The remaining soil is about equally divided as pasture and idle land.

This soil is suited to almost all the general crops of the area and to orchard fruits, grapes, and vegetables. This is probably the only soil in the county that is less well suited to pasture than to cultivated crops.

A few small areas are droughty, but the soil normally has good moisture relations. Natural fertility is low, however, and for good yields complete fertilizer and manure are needed. Because the soil is extremely acid to strongly acid, for good yields it requires at least 2 or 3 tons of ground limestone per acre as an initial application. Lime may be applied sparingly for potatoes, strawberries, and similar acid-tolerant plants. Because the contours of this soil are irregular, orkamy, contour tillage and other erosion control practices based on contouring would be extremely difficult. The soil absorbs rainfall readily, however, and erosion is negligible.

Woostern gravelly loam, 12 to 20 percent slopes (Wo; group 5).—This soil is similar to Woostern gravelly loam, 0 to 12 percent slopes, but because of the steeper slopes, it is more erodible. Sharp contours make erosion control difficult. Only about one-fourth of this soil is cropped, and this is in the less rolling and less kamy areas. More than one-third of the soil is equally divided as pasture and idle land. The idle land has a growth of poplar, yellow birch, and ferns. About one-fourth of this soil is in forests of pine, maple, beech, and oak.

Woostern gravelly loam, 20 to 30 percent slopes (Wp; group 11A).—This hilly soil is similar to Woostern gravelly loam, 12 to 20 percent slopes, but it occurs on high kames and sides of valleys where the contours are very sharp and irregular. About one-tenth is in crops. More than one-third is wooded, and one-quarter is pastured. Because of the sharp contours and erosion hazards on the steeper slopes, this hilly soil is better suited to pasture, orchard, or forest than to cultivated crops.

Woostern gravelly loam, 30 to 50 percent slopes (Wr; group 13B).—More than one-half of this steep soil is wooded, and the rest is cleared. About one-fifth is in pasture, and less than one-fifth is idle land or old fields that have a second growth of poplar, yellow birch, and ferns. None of this steep soil is in row crops, but a few of the less steep areas could be used for hay or grains.

General Nature of the Area

Climate

The climate of Potter County is cool and humid. Almost one-third of the annual precipitation falls as snow during the long winters. The short cool summers favor the formation of acid soils and the growing of grains, hay, and potatoes.

The normal monthly, seasonal, and annual temperature and precipitation at Coudersport is given in table 2. No records were available to show the length of the growing season at Coudersport, but at Wellsboro, in adjacent Tioga County, the average growing season is 133 days. The average growing season at West Bingham in the northeastern part of the county is only 77 days. West Bingham, however, is at a high altitude and its growing season is therefore short.

Extended droughts are uncommon, but periods of dry weather often occur in August and in October and November. The dry weather of August may damage the pastures and potatoes, but that of October and November damages crops very little. Rainfall is generally well distributed, and cloudy and showery weather occurs during spring and summer. The average annual precipitation is about 41 inches, more than half of which falls in spring and summer.

TABLE 2.—*Normal temperature and precipitation at Coudersport, Potter County, Pa.*

[ELEVATION, 1,690 FEET]

Month	Temperature[1]	Precipitation[2]		
	Average	Average	Driest year (1930)	Wettest year (1942)
	°F.	*Inches*	*Inches*	*Inches*
December	26.5	3.66	1.73	3.67
January	24.2	2.79	3.30	1.88
February	24.2	2.54	1.95	3.46
Winter	24.9	8.99	6.98	9.01
March	33.5	3.37	3.62	5.24
April	44.8	3.69	3.99	2.56
May	56.1	4.50	2.42	4.59
Spring	44.8	11.56	10.03	12.39
June	63.6	4.58	4.33	3.22
July	67.9	3.47	1.16	14.39
August	66.4	3.39	.87	5.20
Summer	65.9	11.44	6.36	22.81
September	60.1	3.27	2.79	5.54
October	48.9	3.33	.78	3.14
November	37.1	2.93	1.77	3.97
Fall	48.7	9.53	5.34	12.65
Year	46.1	41.52	28.71	56.86

[1] Average temperature based on a 9-year record, in the period 1940–1953.

[2] Average precipitation, wettest and driest years based on a 16-year record, in the period 1927–1952.

Snow generally covers the ground throughout January and February, but frequently in December and March the snow melts and the ground is exposed. Long snowfalls frequently occur, but these are offset by periods of warm weather. A few winters are very cold, and the snow does not melt for weeks at a time. When the snow finally does melt, the soil becomes saturated, and landslides are frequent on the steeper slopes and along road cuts. Hills and slopes with southern exposures are almost always free of snow before those with northern exposures. Frequently grazing can be started on southern slopes 2 weeks earlier than on northern slopes. The average period of grazing is about 150 days, from late May into October.

Water Supply

Springs, small streams, and brooks supply most of the farms of the county with water. Springs are common and many flow all year. Many have enough flow to supply the farmhouses and barns with running water. Others are large enough to supply small communities. Generally pastures are established along small streams or brooks.

Deep and shallow wells also supply water. The average depth of the wells on the ridges is about 200 feet. At Fox Mountain south of Austin it may be necessary to drill almost 300 feet for a good well. The wells that are dug are commonly about 70 feet deep, but a few are as deep as 126 feet. Normally the dug wells supply less water than the deeper, drilled wells. A well near Raymond, however, is only 100 feet deep, yet it furnishes Gold with a continuous supply of water.

Topography[4]

Potter County is a high, dissected plateau. This plateau is interrupted by slightly lower uplands that trend generally northeastward. In the central part of the county the ridges of the plateau remnants are as high as 2,560 feet. In this area the local relief is generally 300 to 800 feet.

The peripheral plateau remnants near the boundary of the county are somewhat lower than those in the central area. They are from 2,200 to 2,400 feet above sea level. In this peripheral area the major streams have more deeply dissected the plateau and caused greater local relief than that prevailing in the central divide. Local relief along Pine Creek and First Fork Sinnemahoning Creek is as much as 1,100 feet. The crests of the ridges are flattish, very irregular in outline, and normally less than one-half mile wide. Generally, sharp breaks in slopes at the edges of the ridgetops accentuate the flat surfaces of the crests.

The hills of the slightly lower uplands that trend northeast are generally 100 to 200 feet lower than the adjacent plateau remnant. The local relief of this lower area is also less, or from 200 to 400 feet. The hills do not have pronounced flat tops, and they slope smoothly from crest to valley floor.

The slopes of both the higher ridges and rounded hills are long, smooth, and uniform or slightly concave. Except in the extreme southern part of the county, there generally are few outcrops of rock. Normally, the flood plains are narrow, but on the larger streams some flood plains are as much as one-half mile wide. In some parts of the county along the upper reaches of the streams, slopes are steep and smooth and no flood plains occur between them.

A surface mantle of varying thickness completely covers the bedrock of almost the entire region. These surface deposits generally are thicker on the lower slopes. Thick deposits of drift occasionally interrupt the smooth lower slopes of the glaciated northern part of the county. These deposits locally produce a reduced ground-moraine topography. Throughout the unplowed areas of the county, the throwing down of trees by wind has caused a pronounced microrelief of 1 to 4 feet.

Drainage

The waters of Potter County drain into the three principal watersheds of the eastern United States.

[4] The information in this section was taken from VEGETATION ADJACENT TO THE BORDER OF THE WISCONSIN DRIFT IN POTTER COUNTY, PENNSYLVANIA (*9*).

Three springs, on a farm on top of a hill near Gold, are the headwaters of three large streams that drain much of the county. These streams are the Genesee River, which flows into Lake Ontario; the Allegheny River, which flows into the Ohio River; and Pine Creek, a tributary of the West Branch Susquehanna River. The Susquehanna flows into Chesapeake Bay.

The Genesee River—the most northerly stream—drains the north-central part of the county. Oswayo Creek drains the northwestern corner, and the Cowanesque River drains the northeastern part. In the northern third of the county, a height of land passes generally eastward north of Hebron Centre and south of Gold.

The central part of the county is drained to the west by the Allegheny River and to the east by Pine Creek and its tributaries. The height of land between these two streams has an irregular northerly trend. It forms a rough T with the height of land from which flow the northern streams. Rose Lake, the only natural lake in the county, is on the divide between the Allegheny and Genesee drainage basins. Many small bogs and poorly drained areas occur in the glaciated part of the county.

The entire southern part of the county is drained by Sinnemahoning and Kettle Creeks. These creeks empty into the West Branch Susquehanna River. Unlike the west-central and northern streams in their broad, nearly level valley floors, the southern streams descend steeply. Pine Creek, in the central part of the county, also has a relatively steep gradient, but its valley floor is wider than those in the south.

The height of land that divides the streams of the central part of the county from the streams of the southern part is much more irregular than the height of land between the central streams and those of the north. Like the high land in the north, that in the south extends generally east and west. It forms a rough I by adding a lower horizontal line to the T formed by the northern and central heights.

In spring, rain and melting snow almost always cause the streams to rise. Most streams have shallow beds that are frequently obstructed by gravel bars. Prolonged rains normally cause the streams to flood at these bars and cover the lower parts of the bottom lands. These floods are increasing. They cause a problem in the southern part of the county, where most of the cleared land is on bottom lands. The bottom lands of the northern part of the county can be used for pastures, because enough upland is available for crops. In the south, steep slopes and wooded areas limit cultivation.

Unless the stream channels are cleared and the floods controlled, the flood plains along streams cannot be cultivated. The floods are not severe, and normally, except at the gravel bars, the streams remain in their channels. If the stream beds were deepened at the bars, excess water would probably be carried off. During late summer and in fall, floods are less frequent than in spring and winter. At times during early summer, when it is hot and humid, cloudbursts occur.

Rock Formations[5]

Gently folded sedimentary rocks constitute the bedrock of Potter County. These rocks range in age from Upper Devonian to Pennsylvanian. Six major anticlines, six intervening major synclines, and various lesser folds trend northeast. The slightly lower rounded uplands are of the Chemung and Catskill formations. These formations are exposed in the anticlinal ridges. The higher plateau remnants are of the Pocono and Pottsville formations. These formations cap the synclinal ridges.

Boulders of fine-grained conglomerate or coarse-grained sandstone of the Pottsville or Pocono formations occur on many of the higher ridges. These boulders are angular, light gray, and massive. Conglomeratic boulders, some as large as small houses, are numerous on slopes and valley floors, and they often form blockfields, particularly at the heads of streams. Most of the mass of the higher ridges is made of fine-grained sandstone and shale of the Pocono formation. The sandstone and shale are greenish gray and thin bedded. They occasionally cap the rounded hills in the anticlinal valleys.

The "redbeds" of the Catskill formation constitute the rounded hills in most of the anticlinal valleys. They also underlie the lower slopes of many of the higher ridges. These "redbeds" are a series of red sandstone and shale that are interbedded with gray and green sandstone and shale.

The Chemung formation is exposed occasionally in the anticlinal lowlands. This formation is extensive in the northeastern and northwestern parts of the county. Its sandstone and shale closely resemble the thin-bedded sandstone of the Pocono formation. In the northwestern part of the county the Chemung formation forms rather high, steep-sided ridges similar to those underlain by the sandstone of the Pocono formation.

Glacial Geology[6]

The southern border of the Wisconsin drift extends across the northern part of Potter County from the northwestern corner to Pine Creek. This border can be closely defined by the positions of the southernmost igneous and metamorphic stones. It can also be defined by the remnants of subdued morainal topography. According to Denny (*6*), the drift belongs to the Iowan or Tazewell substages of the Wisconsin and is the same as the Olean drift mapped by MacClintock and Apfel (*13*) in New York State.

The glacial materials of the county were derived almost entirely from the sandstone, shale, and siltstone of the country rock. A few limestone pebbles occur. These pebbles are believed to be derived from lenses of impure limestone and calcareous sandstone of various formations. Less than 1 percent of the deposits consist of erratics that were derived from igneous and metamorphic rocks.

[5] See footnote 4, p. 40.
[6] See footnote 4, p. 40.

On the upper slopes and summits the glacial till is thin, but frequently on lower slopes the till is thicker. When the rare morainal topography occurs, it is subdued. Stratified drift is also scarce, but kame terraces occur at the edge of some of the stream valleys.

The structure of the upper part of the till is loose, but normally the till is more compact with depth. Many angular rock fragments occur through the material.

Surface Features Attributed to Pleistocene Frost Action[7]

Arrangements of soil and rock material similar to the arrangements now forming in the arctic and alpine regions occur in Potter County. These arrangements occur both within and south of the Wisconsin drift area as boulder rings, boulder stripes, and blockfields. In boulder rings, rock fragments are grouped in a circular pattern, and in boulder stripes the patterns are linear. According to Denny (*6*), these features are probably the result of processes that were caused by the presence of the adjacent Wisconsin sheet. Denny suggests that they were formed when frost action was much more intense than it is now.

Outside the drift border, the soil material that mantles the bedrock strongly resembles the deposits of the glaciated region. The nonglaciated area of the county has a mantle of unconsolidated debris, largely rubble. Much of the debris is an unsorted, heterogenous mass. This mass contains rock fragments that range in size from a fraction of an inch to tens of feet in diameter. The rock fragments make up from 1 to almost 100 percent of the debris. Much of the material of the lower valley walls is colluvium.

In many places the flat surfaces of the flagstones are essentially parallel to the slope of the ground. In other places the longest axis of the flagstones may dip toward the top of the slope and be at a small angle with the surface of the ground.

Most rubble on the surface is not oriented in a specific pattern, except when the rock fragments form boulder rings or boulder stripes. In places where the surface mantle contains much fine material and few rock fragments, the soil material does not contain erratics or striated fragments. The surface mantle ranges from 1 to more than 10 feet in thickness.

On the uplands there is evidence that the surface mantle has moved down very gentle slopes and in one place it has accumulated to a thickness of at least 10 feet. The soil profile of the upper part of this mantle suggests that the mantle has been stable at least 500 to 1,000 years. Its degree of weathering compares with that on the adjacent Wisconsin drift. Most of the deposits on the uplands are probably debris that was caused by seasonal freezes and thaws. The colluvial deposits on the lower slopes seem to be the result of slope wash, creep, and solifluction.

Small patches of ancient soils, believed to date from the last interglacial stage (Sangamon), occur outside the Wisconsin drift in a few areas of the county. These are believed to be soils of the Red-Yellow Podzolic great soil group. Red-Yellow Podzolic soils occur throughout a large area in southeastern United States. Perhaps these lenses of ancient subsoil represent the soil materials that covered the landscape before the advance of the Wisconsin ice. This ancient mantle was probably almost completely removed, or it was mingled with fresh material derived from the underlying rock by processes associated with intense frost action. The mantle of unconsolidated debris that now occurs in the periglacial (frost-worked) region probably resulted from these processes.

Vegetation[8]

Potter County lies within two forest regions that are described by Goodlett—the Northern Hardwood region that includes most of the county and the Oak Forest region that includes smaller areas near the periphery, particularly in the southernmost parts.

In the Northern Hardwood region the principal trees are sugar maple, red maple, yellow birch, beech, black cherry, red oak, and hemlock. Also common are black birch, white ash, basswood, large-toothed aspen, and trembling aspen.

In the Oak Forest region the principal trees are white oak, red oak, chestnut oak, black birch, red maple, beech, and hemlock. Less common are hickory, basswood, large-toothed aspen, cucumbertree, and white pine.

The forests of the two regions can be subdivided into four forest types. In the Northern Hardwood region the stands that essentially lack oak and consist mainly of beech, sugar maple, yellow birch, black cherry, and hemlock are called the *beech-birch-maple type.* Other stands in this region contain as many as 15 species, including red oak. These stands are called the *red oak forest type.* In addition to the trees of the beech-birch-maple type, the red oak type has many white ash, basswood, black birch, and red maple.

In the Oak Forest region the stands that contain chestnut oak are called the *chestnut oak type.* Other stands in this region consist of white oak, red oak, red maple, black birch, beech and sometimes hickory. Goodlett calls these stands the *white oak forest type.* Like the Northern Hardwood region, the Oak Forest region has stands of the red oak type, or stands that lack chestnut oak, white oak, and hickory.

Following is a list of trees, shrubs, and other plants that are common in the county:

TREES

Scientific name	*Common name*
Acer rubrum	Red maple.
A. pensylvanicum	Striped maple.
A. saccharum	Sugar maple.
A. spicatum	Mountain maple.
Betula lenta	Black birch.
B. lutea	Yellow birch.

[7] See footnote 4, page 40.

[8] Much of the information in this section was taken from VEGETATION ADJACENT TO THE BORDER OF THE WISCONSIN DRIFT IN POTTER COUNTY, PENNSYLVANIA (*9*).

Scientific name	*Common name*
B. papyrifera	Paper birch.
Carya glabra	Pignut hickory.
C. ovata	Shagbark hickory.
Castanea dentata	Chestnut.
Cornus alternifolia	Alternate-leaved dogwood.
C. florida	Flowering dogwood.
Crataegus spp	Hawthorn.
Fagus grandifolia	Beech.
Fraxinus americana	White ash.
Hamamelis virginiana	Witch-hazel.
Juglans cinerea	Butternut.
Larix laricina	Larch.
Liriodendron tulipifera	Tulip tree.
Magnolia acuminata	Cucumbertree.
Ostrya virginiana	Hophornbeam.
Picea mariana	Black spruce.
P. rubra	Red spruce.
Pinus resinosa	Red pine.
P. rigida	Pitch pine.
P. strobus	White pine.
Platanus occidentalis	Sycamore.
Populus grandidentata	Large-toothed aspen.
P. tremuloides	Trembling aspen.
Prunus pensylvanica	Fire cherry.
P. serotina	Black cherry.
P. virginiana	Chokecherry.
Fraxinus americana	Mountain-ash.
Quercus alba	White oak.
Q. prinus	Chestnut oak.
Q. rubra	Red oak.
Q. velutina	Black oak.
Salix discolor	Large pussywillow.
Sassafras albidum	Sassafras.
Tilia americana	Basswood.
Ulmus americana	American elm.
Shrubs, Ferns, and Grasses	
Adiantum pedatum	Maidenhair.
Amelanchier canadensis	Shadbush.
Comptonia peregrina	Sweetfern.
Dennstaedtia punctilobula	Hay-scented fern.
Dryopteris marginalis	Marginal shieldfern.
D. noveboracensis	New York fern.
D. spinulosa	Spinulose woodfern.
Hordeum jubatum	Squirreltail.
Kalmia latifolia	Mountain-laurel.
Lycopodium annotinum, *L. clavatum*, *L. complanatum*, *L. obscurum*	Ground pine or clubmoss.
Panicum capillare	Witchgrass.
Polystichum acrostichoides	Christmas fern.
Pteridium aquilinum	Bracken.
Rhus copallina	Dwarf sumac.
R. typhina	Staghorn sumac.
Vaccinium angustifolium	Blueberry.
Viburnum acerifolium	Maple-leaved viburnum.

In Potter County the same forest types are generally found on soils that have somewhat similar characteristics. The beech-birch-maple type, however, occurs on two different kinds of soils: (1) deep or very deep, medium-textured soils that have friable to firm subsoils and substrata; and (2) soils with brittle subsoils (fragipans) that are somewhat poorly drained or moderately well drained.

Like the beech-birch-maple type, the red oak type occurs on deep or very deep, medium-textured soils that have friable to firm subsoils. These soils are most frequently at high altitudes on frost-worked or residual materials.

The chestnut oak type is generally on shallow to moderately deep soils that are moderately coarse textured to medium textured and well to excessively drained.

The white oak type occurs on soils that are similar to the soils of the beech-birch-maple type. These soils are deep to moderately deep, well drained, and medium textured. They have firm subsoils.

Lime-loving plants generally occur in the few areas that have calcareous outcrops or limy material in the lower substratum.

Many species, mainly trembling aspen, hawthorn, chokecherry, and fire cherry, grow in old fields. These fields occasionally contain white pine that normally originates from a nearby source of seed. Plantations of white pine, red pine, Scotch pine, European larch, and other conifers in pure and mixed stands are scattered throughout the county. A few stands of tamarack and black spruce grow in small swampy or mucky areas.

The forests of Potter County are of all ages and conditions. Most of the trees are 40 to 60 years old and have grown up since the cutting of the presettlement woodlands. A forest that is mainly hardwood has replaced the presettlement forest. Except for a few acres that have been planted, little white pine now occurs. Hemlock is fairly common. Because the timber was rapidly clear cut in the late 1800's and early 1900's, many stands present a parklike appearance. Stands that have trees of uniform height and of practically the same age spread unbroken for many miles across the ridges and valleys.

In some places under stands of beech, birch, and maple, the undergrowth consists of ground pines, mosses, and ferns. Where ash is abundant, rhododendron, laurel, huckleberry, and ferns form a dense, scrubby undergrowth. Figure 9 shows the location of the State forest in Potter County.

The State began to acquire the cutover lands in the early 1900's. Piles of slash and other logging waste caused fires that burned over most of the denuded lands. It appeared that the cutover lands would not produce a crop of wood for a long time. Until 1950, therefore, the management of State forests in Potter County consisted mainly of fire protection. But in a few old fields or clearings, plantations were started. Almost 240 plantings have been made, but they average hardly more than 30 acres. The total area in planted forests in the county is about 6,000 acres, or less than 3 percent of the State forest.

Early History

Potter County was included in a tract purchased from the Delaware Indians after the treaty at Fort Stanwix was negotiated in 1784. A little later the town of Shinglehouse was settled in the northwestern corner of the county (*4*). The area was then a wilderness of pine and hemlock, with hardwoods growing on the ridges. Wolves, bears, panthers, deer, and other game were plentiful. After a road running east and west was built through the county in 1808, the northern part was rapidly settled.

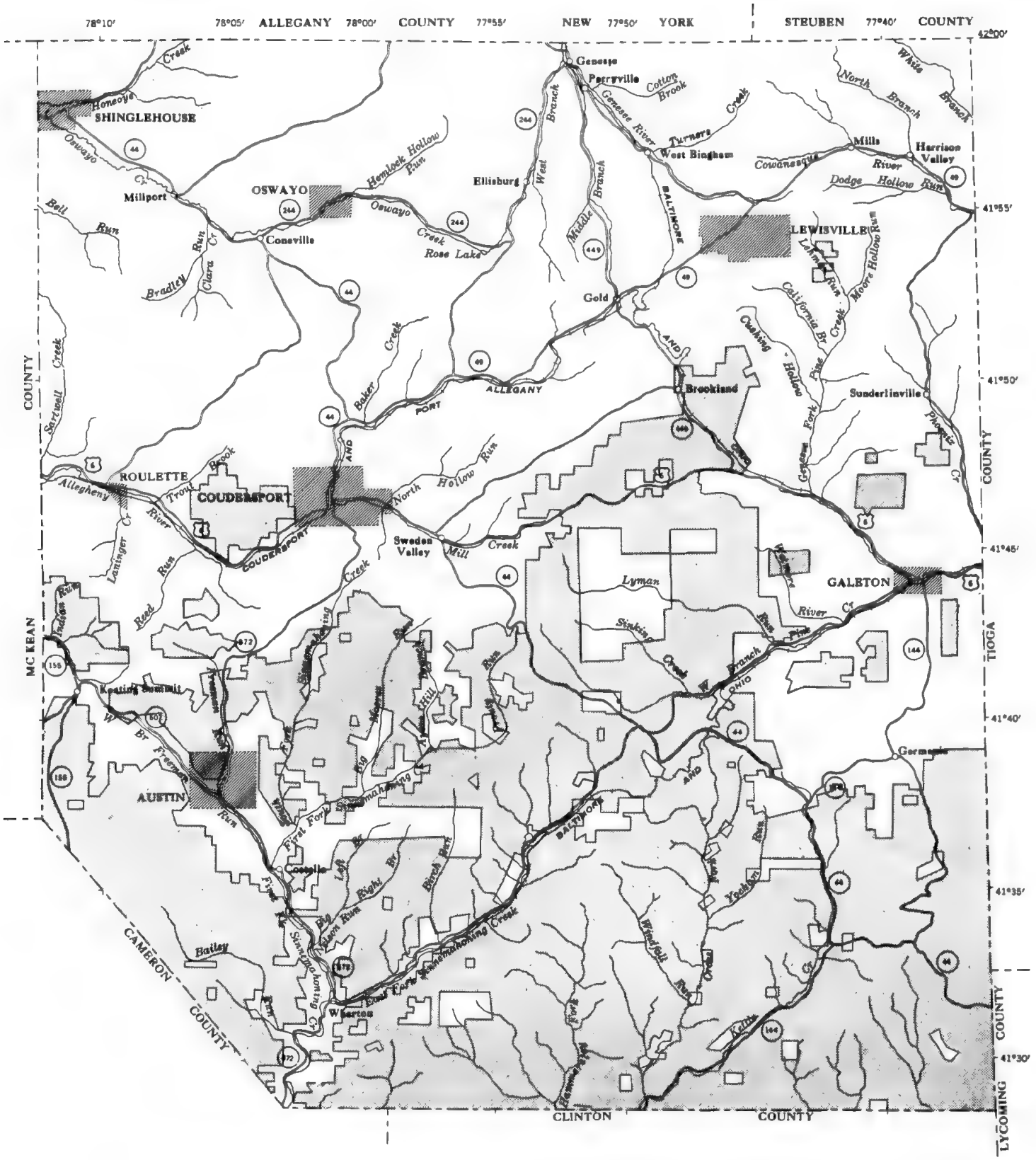

Figure 9.—Location of State forest in Potter County in 1950. The State forest is shown by shading.

Timber dominated in the early history of the county. The great pine forests were cut, and the logs were rafted down the streams into the Allegheny and Susquehanna Rivers. Hemlock was cut and its bark removed for tanning. For years the hemlock logs were left to rot, but after the late 1800's both hemlock bark and logs were used. Tanning and leather making were important early industries. Very large tanneries operated at Galeton, Oswayo, Harrison Valley, Coudersport, and Costello, but today tanning persists only at Coudersport.

Industries

Although farming has replaced lumbering as the foremost enterprise in Potter County, lumbering is still important. Several lumber concerns and paper and pulp companies operate. The State of Pennsylvania, through its Department of Forests and Waters, controls more than half the woodlands for the county. The forests have large potential production.

Several hundred people are engaged in industrial enterprises. Some of these enterprises, such as dairying and tanning, are intimately connected with agriculture and lumbering. At least 10 firms each employ more than 50 people. The principal industrial products are sole leather, wood distillates, gloves, silk and rayon hosiery, cheese, and surgical appliances. For many years some oil has been produced. Near Wharton, gas wells have had large flows for short periods.

Transportation

No place in the county is more than 3 miles from an accessible trail or automobile road. Most of the areas that are not accessible to vehicles can be reached by footpaths. Several State highways serve the northern and central parts of the county, and U. S. Highway 6 runs through the middle. South of U. S. Highway 6, the hard-surfaced roads are fewer, but all-weather graveled roads cross the State forests in several directions.

Buses and trucks are the principal means of transportation. Coudersport is served by the Coudersport and Port Allegany Railroad, which meets the Baltimore and Ohio near Gold at Newfield Junction. Freight travels into the national railroad systems from Newfield Junction. For long trips, passengers generally go by car or bus to Port Allegany in McKean County and board the trains of the Pennsylvania Railroad. This railroad runs through Keating Summit. Airports are located at Cherry Springs, (post office, Ulysses), Lewisville, and Denton Hill.

Organization and Population

In 1804 Potter County was organized from a part of Lycoming County. The first county commissioners, elected in 1815, served both Potter and McKean Counties. Since Potter and McKean Counties separated in 1824, Potter has elected its own commissioners. The first courthouse was erected in 1835 at Coudersport. The first school in Potter County was established in 1816 on Ayers Hill.

In 1950, of a total population of 16,810 in Potter County, 13,600 people were classed as rural. Coudersport (pop. 3,210) is the county seat and largest town. Other organized boroughs in the county and their populations are: Galeton, 1,646; Shinglehouse, 1,201; Austin, 804; Lewisville, 495; and Oswayo, 167.

Cultural Facilities

Almost all of the established towns have grade schools, and buses bring children from outlying places to classes. At the time of this survey high schools operated at Austin, Shinglehouse, Lewisville, Coudersport, Genesee, and Galeton. Churches are well distributed over the central and northern parts of the county but in the south they are only at settlements in the State forests. Several grange halls and community buildings are located throughout the county.

Most of the farms and town homes have electricity, and telephone or telegraph lines serve most of the communities. In 1950 about 85 percent of the farms of the county had electricity, and about 60 percent had telephones. Many of the hunting camps, temporary summer homes, and woodcutters' dwellings do not have electricity.

Agriculture

Discussed in this section are land use, types and sizes of farms, principal crops and kinds of pasture, livestock, fertilization and liming, and other subjects needed to give an over-all picture of agriculture in the county. Except in the subsection on land use, the statistics given are from the United States Census of Agriculture.

Land Use

Figure 10 shows that most of the land in Potter County is not suited to farming. The main farming areas occur in the northern and northeastern parts of the county and around Germania. Even in these areas large tracts are idle or in forest. Less than one-third of the county is in farms. Table 3 gives the percentage of each soil in crops, pasture, forest, and urban developments, or left idle.

Most of the cleared land is in the northern half of the county because the soils are generally deeper and less steep than those in the southern part. The northeastern section of the county contains about 80 percent of the area best suited to cultivation. In this section many acres of deep, well-drained, level or gently rolling soils are in crops, pasture, forest, or are idle.

The rest of the county is best suited to forest because most of the soils are too steep, stony, wet, or shallow for cultivation. But small areas of very good soils that could be cultivated occur mainly on the bottom lands and as colluvial fans at the mouths of streams.

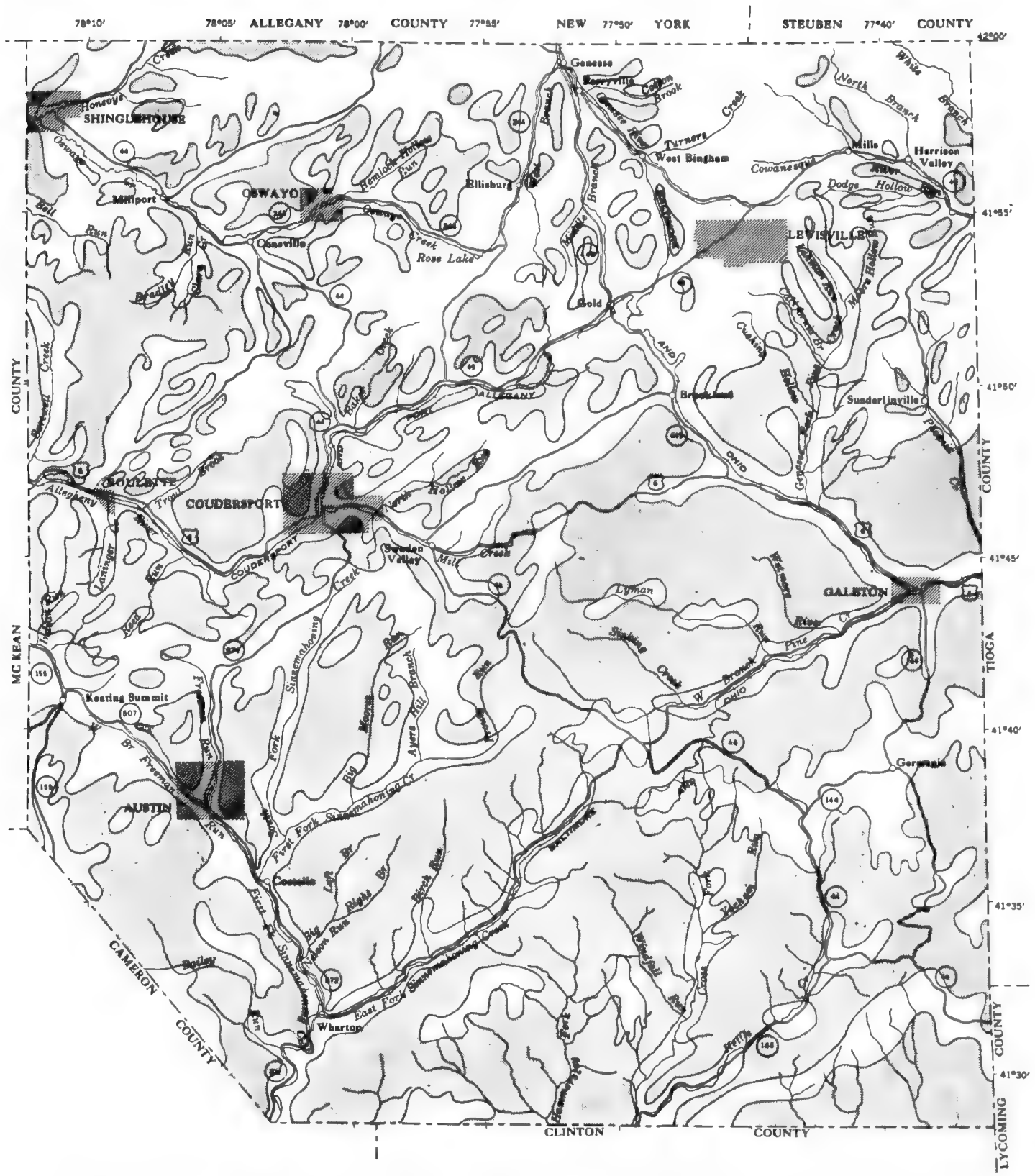

Figure 10.—**Distribution of arable and nonarable lands in Potter County, Pennsylvania. Nonarable land shown by shading.**

TABLE 3.—*Approximate percentage of soils in crops, pasture, forest, and idle and urban land*

Soil	Crop	Pasture	Idle	Forest	Urban
Barbour fine sandy loam, 0 to 3 percent slopes.	11	10	39	40	(1)
Barbour fine sandy loam, high bottom phase, 0 to 3 percent slopes.	31	20	35	11	3
Barbour gravelly fine sandy loam, 0 to 3 percent slopes.	21	20	18	39	2
Basher sandy loam, 0 to 3 percent slopes.	6	17	25	48	4
Basher silt loam, 0 to 3 percent slopes.	25	31	19	21	4
Basher silt loam, high bottom phase, 0 to 3 percent slopes.	39	26	19	14	2
Bath channery silt loam, 0 to 12 percent slopes.	33	5	11	50	1
Bath channery silt loam, 12 to 20 percent slopes.	26	10	12	51	1
Bath channery silt loam, 20 to 30 percent slopes.	14	12	15	59	(1)
Bath channery silt loam, 30 to 40 percent slopes.	4	9	8	79	-------
Braceville gravelly silt loam, 0 to 3 percent slopes.	29	31	11	14	15
Brinkerton and Armagh silt loams, 0 to 15 percent slopes.	16	12	15	55	2
Brinkerton and Armagh silt loams, 15 to 50 percent slopes.	2	61	21	16	(1)
Cattaraugus channery loam, 0 to 12 percent slopes.	25	5	8	60	2
Cattaraugus channery loam, 12 to 20 percent slopes.	20	9	10	60	1
Cattaraugus channery loam, 20 to 30 percent slopes.	10	9	11	70	(1)
Cattaraugus channery loam, 30 to 40 percent slopes.	2	6	5	87	(1)
Cattaraugus stony loam, 0 to 20 percent slopes.	(1)	6	3	91	-------
Cattaraugus stony loam, 20 to 30 percent slopes.	1	7	2	90	-------
Cattaraugus and Lackawanna channery loams, 40 to 60 percent slopes.	(1)	9	4	87	(1)
Cattaraugus and Lackawanna stony loams, 30 to 60 percent slopes.	(1)	2	1	97	-------
Cavode channery silt loam, 0 to 8 percent slopes.	9	7	20	64	(1)
Cavode channery silt loam, 8 to 15 percent slopes.	20	14	18	47	1
Cavode channery silt loam, 15 to 25 percent slopes.	11	9	3	75	2
Cavode silt loam, 0 to 8 percent slopes.	2	1	10	87	-------
Cavode silt loam, 8 to 15 percent slopes.	(1)	1	6	93	-------
Cavode silt loam, 15 to 25 percent slopes.	-----	21	-----	79	-------
Cavode stony silt loam, 0 to 15 percent slopes.	-----	3	6	91	-------
Cavode stony silt loam, 15 to 50 percent slopes.	-----	9	-----	91	-------
Chenango gravelly loam, 0 to 12 percent slopes.	44	23	12	6	15
Chenango gravelly loam, 12 to 20 percent slopes.	17	7	23	23	30
Chenango gravelly loam, 20 to 50 percent slopes.	13	32	8	45	2
Chippewa silt loam, 0 to 8 percent slopes.	8	50	22	19	1
Chippewa stony silt loam, 0 to 8 percent slopes.	-----	8	2	90	-------
Clymer channery loam, 0 to 12 percent slopes.	3	1	3	93	-------
Clymer channery loam, 12 to 20 percent slopes.	1	1	4	94	-------
Clymer channery loam, 20 to 30 percent slopes.	1	2	3	94	-------
Clymer stony loam, 0 to 20 percent slopes.	-----	(1)	1	99	-------
Clymer stony loam, 20 to 30 percent slopes.	-----	-------	(1)	100	-------
Cookport channery loam, 0 to 8 percent slopes.	1	(1)	7	92	-------
Cookport channery loam, 8 to 15 percent slopes.	1	3	6	90	-------
Cookport channery loam, 15 to 25 percent slopes.	(1)	1	1	98	-------
Cookport stony loam, 0 to 15 percent slopes.	(1)	1	2	97	-------
Cookport stony loam, 15 to 25 percent slopes.	(1)	2	2	96	-------
Cookport stony loam, 25 to 50 percent slopes.	-----	2	4	94	-------
Culvers channery silt loam, 0 to 8 percent slopes.	37	8	12	42	1
Culvers channery silt loam, 8 to 15 percent slopes.	25	13	14	47	1
Culvers channery silt loam, 15 to 25 percent slopes.	11	13	13	61	2
Culvers channery silt loam, 25 to 35 percent slopes.	3	14	9	74	-------
Culvers stony silt loam, 0 to 15 percent slopes.	1	13	3	83	-------
Culvers stony silt loam, 15 to 25 percent slopes.	1	12	2	85	(1)
Culvers stony silt loam, 25 to 35 percent slopes.	(1)	9	2	89	-------
Culvers and Wellsboro channery silt loams, 35 to 50 percent slopes.	(1)	13	9	78	-------
Dekalb channery loam, 10 to 25 inches deep, 0 to 12 percent slopes.	4	(1)	3	93	-------
Dekalb channery loam, 10 to 25 inches deep, 12 to 20 percent slopes.	5	2	3	90	-------
Dekalb channery loam, 10 to 25 inches deep, 20 to 30 percent slopes.	3	4	5	88	-------
Dekalb channery loam, 40 inches or more deep, 0 to 12 percent slopes.	2	(1)	2	96	-------
Dekalb channery loam, 40 inches or more deep, 12 to 20 percent slopes.	1	1	2	96	-------
Dekalb channery loam, 40 inches or more deep, 20 to 30 percent slopes.	1	1	3	95	-------
Dekalb channery loam, 40 inches or more deep, 30 to 40 percent slopes.	(1)	1	2	97	-------
Dekalb fine sandy loam, 0 to 12 percent slopes.	(1)	-------	(1)	100	-------
Dekalb fine sandy loam, 12 to 30 percent slopes.	-----	-------	-----	100	-------
Dekalb fine sandy loam, 20 to 30 percent slopes.	-----	-------	-----	100	-------
Dekalb stony loam, 10 to 25 inches deep, 0 to 20 percent slopes.	-----	(1)	(1)	100	-------
Dekalb stony loam, 10 to 25 inches deep, 20 to 30 percent slopes.	-----	2	2	96	-------
Dekalb stony loam, 40 inches or more deep, 0 to 20 percent slopes.	(1)	1	(1)	99	-------
Dekalb stony loam, 40 inches or more deep, 20 to 30 percent slopes.	-----	1	(1)	99	-------

See footnote at end of table.

TABLE 3.—*Approximate percentage of soils in crops, pasture, forest, and idle and urban land*—Continued

Soil	Crop	Pasture	Idle	Forest	Urban
Dilldown sandy loam, 0 to 12 percent slopes.	17	13	22	48	-------
Dilldown sandy loam, 12 to 30 percent slopes.	9	12	6	73	-------
Germania silt loam, 0 to 12 percent slopes.	39	13	18	30	-------
Germania silt loam, 12 to 20 percent slopes.	35	6	21	38	-------
Germania silt loam, 20 to 30 percent slopes.	40	12	17	31	-------
Germania silt loam, 30 to 50 percent slopes.	8	18	18	56	-------
Holly sandy loam, 0 to 3 percent slopes.	3	22	21	52	2
Holly silt loam, 0 to 3 percent slopes.	5	37	19	38	1
Lackawanna channery loam, 0 to 12 percent slopes.	44	8	17	30	1
Lackawanna channery loam, 12 to 20 percent slopes.	36	11	20	33	(1)
Lackawanna channery loam, 20 to 30 percent slopes.	25	19	16	40	(1)
Lackawanna channery loam, 30 to 40 percent slopes.	13	22	15	50	-------
Lackawanna channery silt loam, 0 to 12 percent slopes.	20	4	6	68	2
Lackawanna channery silt loam, 12 to 20 percent slopes.	14	6	7	70	3
Lackawanna channery silt loam, 20 to 30 percent slopes.	8	7	9	73	3
Lackawanna channery silt loam, 30 to 40 percent slopes.	1	4	3	92	(1)
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 0 to 12 per- slopes.	8	2	5	85	-------
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 12 to 20 percent slopes.	4	1	4	91	-------
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 20 to 30 percent slopes.	1	1	4	94	-------
Lackawanna stony loam, 0 to 20 percent slopes.	2	7	8	83	(1)
Lackawanna stony loam, 20 to 30 percent slopes.	1	3	4	92	(1)
Leetonia stony sandy loam, 0 to 12 percent slopes.	-----	(1)	2	98	-------
Leetonia stony sandy loam, 20 to 30 percent slopes.	-----	-------	-----	100	-------
Leetonia channery loamy sand and Dekalb channery loam, 30 to 60 percent slopes.	-----	-------	-----	100	-------
Leetonia and Dekalb very stony soils, 0 to 20 percent slopes.	-----	-------	-----	100	-------
Leetonia and Dekalb very stony soils, 20 to 30 percent slopes.	-----	-------	-----	100	-------
Leetonia and Dekalb very stony soils, 30 to 70 percent slopes.	-----	-------	-----	100	-------
Lordstown channery silt loam, 0 to 12 percent slopes.	25	6	9	59	1
Lordstown channery silt loam, 12 to 20 percent slopes.	25	12	15	48	-------
Lordstown channery silt loam, 20 to 30 percent slopes.	13	9	14	64	-------
Lordstown channery silt loam, 30 to 40 percent slopes.	3	12	10	75	-------
Lordstown stony loam, 0 to 20 percent slopes.	1	3	6	90	-------
Lordstown stony loam, 20 to 30 percent slopes.	(1)	14	6	80	-------
Lordstown and Bath channery silt loams, 40 to 60 percent slopes.	-----	4	5	91	-------
Lordstown channery silt loam, neutral variant, 0 to 30 per- cent slopes.	20	10	25	40	5
Mardin channery silt loam, 0 to 8 percent slopes.	21	7	14	56	2
Mardin channery silt loam, 8 to 15 percent slopes.	17	10	11	62	(1)
Mardin channery silt loam, 15 to 25 percent slopes.	11	15	10	61	3
Mardin channery silt loam, 25 to 50 percent slopes.	3	19	9	69	(1)
Middlebury sandy loam, 0 to 3 percent slopes.	6	30	28	36	(1)
Middlebury silt loam, 0 to 3 percent slopes.	10	38	10	40	2
Middlebury silt loam, high bottom phase, 0 to 3 percent slopes.	22	32	14	25	7
Minora silt loam, 0 to 12 per- cent slopes.	(1)	2	(1)	98	-------
Minora silt loam, 12 to 20 per- cent slopes.	1	-------	6	93	-------
Minora silt loam, 20 to 30 per- cent slopes.	2	-------	3	95	-------
Mixed alluvium, 0 to 5 percent slopes.	1	18	12	69	(1)
Morris silt loam, 0 to 3 percent slopes.	39	18	18	24	1
Morris silt loam, 3 to 8 percent slopes.	27	23	21	28	1
Morris silt loam, 8 to 15 per- cent slopes.	22	27	21	29	1
Morris silt loam, 15 to 25 per- cent slopes.	13	21	26	39	1
Morris silt loam, 25 to 50 per- cent slopes.	7	38	21	33	1
Morris stony silt loam, 0 to 15 percent slopes.	2	32	10	54	2
Morris stony silt loam, 15 to 25 percent slopes.	2	38	9	51	(1)
Morris stony silt loam, 25 to 50 percent slopes.	-----	41	8	51	-------
Nolo channery silt loam, 0 to 8 percent slopes.	-----	1	3	96	-------
Nolo stony sandy loam, sandy variant, 0 to 12 percent slopes.	-----	-------	2	98	-------
Norwich silt loam, 0 to 15 per- cent slopes.	8	50	23	19	(1)
Norwich stony silt loam, 0 to 15 percent slopes.	4	54	7	35	-------
Oquaga channery loam, 0 to 12 percent slopes.	14	6	10	69	1
Oquaga channery loam, 12 to 20 percent slopes.	14	10	13	63	(1)
Oquaga channery loam, 20 to 30 percent slopes.	9	13	11	66	1
Oquaga channery loam, 30 to 50 percent slopes.	1	2	2	95	(1)
Oquaga stony loam, 0 to 20 percent slopes.	1	5	3	90	1
Oquaga stony loam, 20 to 30 percent slopes.	-----	12	7	81	-------
Oquaga stony loam, 30 to 60 percent slopes.	(1)	2	1	97	(1)
Papakating silt loam, 0 to 3 percent slopes.	2	21	21	55	1
Peat and muck, undifferen- tiated, 0 to 3 percent slopes.	-----	23	17	60	-------

See footnote at end of table.

TABLE 3.—*Approximate percentage of soils in crops, pasture, forest, and idle and urban land*—Continued

Soil	Crop	Pasture	Idle	Forest	Urban
Red Hook silt loam, 0 to 3 percent slopes.	17	35	19	24	5
Riverwash, 0 to 3 percent slopes.	-----	8	25	66	1
Scio fine sandy loam—silt loam, 0 to 3 percent slopes.	38	20	17	14	11
Sweden loam, 0 to 12 percent slopes.	26	1	20	52	1
Sweden stony loam, 0 to 12 percent slopes.	1	-------	9	90	-------
Tioga fine sandy loam, 0 to 3 percent slopes.	25	29	21	9	16
Tioga fine sandy loam, high bottom phase, 0 to 3 percent slopes.	37	13	18	8	24
Tioga gravelly loam, 0 to 3 percent slopes.	18	21	23	20	18
Tunkhannock flaggy loam, 3 to 20 percent slopes.	2	4	6	88	(1)
Tunkhannock flaggy loam, 20 to 30 percent slopes.	2	5	7	85	1
Tunkhannock flaggy loam, 30 to 50 percent slopes.	6	32	24	29	9
Tunkhannock gravelly loam, 0 to 12 percent slopes.	35	15	22	21	7
Tunkhannock gravelly loam, 12 to 20 percent slopes.	17	23	23	32	5
Unadilla fine sandy loam, 0 to 3 percent slopes.	22	9	5	18	46
Unadilla silt loam, 0 to 3 percent slopes.	68	24	7	1	(1)
Volusia channery silt loam, 0 to 3 percent slopes.	28	32	10	29	1
Volusia channery silt loam, 3 to 8 percent slopes.	42	24	15	18	1
Volusia channery silt loam, 8 to 15 percent slopes.	41	25	11	22	1
Volusia channery silt loam, 15 to 25 percent slopes.	29	36	12	22	1
Volusia channery silt loam, 25 to 40 percent slopes.	6	22	13	58	1
Volusia flaggy silt loam, 0 to 8 percent slopes.	8	22	20	50	-------
Volusia flaggy silt loam, 8 to 15 percent slopes.	9	30	14	47	-------
Volusia flaggy silt loam, 15 to 25 percent slopes.	7	32	13	48	-------
Vrooman fine sandy loam, 0 to 3 percent slopes.	55	13	20	6	6
Vrooman silt loam, 0 to 3 percent slopes.	68	5	9	17	1
Wellsboro channery silt loam, 0 to 8 percent slopes.	35	6	13	44	2
Wellsboro channery silt loam, 8 to 15 percent slopes.	24	10	13	44	9
Wellsboro channery silt loam, 15 to 25 percent slopes.	15	13	16	55	1
Wellsboro channery silt loam, 25 to 35 percent slopes.	8	27	16	48	1
Wellsboro stony loam, 0 to 15 percent slopes.	(1)	43	(1)	57	-------
Wellsboro stony loam, 15 to 25 percent slopes.	-----	9	5	86	-------
Wellsboro stony loam, 25 to 35 percent slopes.	-----	1	1	98	-------
Wharton channery silt loam, 0 to 12 percent slopes.	2	1	3	94	(1)
Wharton channery silt loam, 12 to 20 percent slopes.	2	1	1	96	-------
Wharton channery silt loam, 20 to 30 percent slopes.	-----	-------	1	99	-------
Woostern gravelly loam, 0 to 12 percent slopes.	44	17	15	23	1
Woostern gravelly loam, 12 to 20 percent slopes.	26	18	18	37	1
Woostern gravelly loam, 20 to 30 percent slopes.	12	25	20	38	5
Woostern gravelly loam, 30 to 50 percent slopes.	5	22	18	53	2

[1] Denotes an acreage of less than 1 percent in this use. Acreages of less than 1 percent not considered in calculating percentages.

Almost all of the southern part of the county is State owned (see fig. 9). Second-growth forest covers most of this area, but there are some excellent stands of hardwoods, many of them ready to cut.

Types and Sizes of Farms

In 1950 there were 1,156 farms in the county, classified as follows:

	Number
Dairy	565
Field crop[1]	57
Poultry	55
General	37
Livestock	19
Vegetable[1]	4
Fruit	5
Miscellaneous and unclassified	414
	1,156

[1] Farms producing mainly potatoes, canning peas, and beans.

The principal types of farming are dairying, general farming, livestock raising, and potato growing. Many dairy and livestock farms grow some potatoes, but most of the potato growers produce this crop alone.

The dairy farms, located near Shinglehouse, Harrison Valley, and Hector, dominate in the northwestern and northeastern sections of the county. Most of the soils of the county best suited to pasture and hay occur in these sections. These soils are only slightly acid.

The potato farms are mainly on the highlands of the plateau, where the soils are generally more acid and not so well drained as elsewhere. The poultry farms are scattered and normally are associated with small cultivated areas.

General farms occur mostly in areas near Germania, Lewisville, and Borie, where the soils are deep and respond well to good management. In these areas peas and beans are grown for canning and for the vegetable market. Some berries are also grown. Almost all of the general farms and some of the dairy farms produce maple sugar.

Specialty farms that use greenhouses are located at Shinglehouse, Galeton, Harrison Valley, Elmer, Lewisville and Coudersport. The few sheep farms of the county occur mainly north of West Pike, near Lewisville, Honeoye, Germania, Coudersport, and Borie.

Land values are only incidentally related to the productivity of the soils. Some of the poorest soils continue to be worked, and they are valued higher than better soils that have been abandoned. Some extremely good soils have been abandoned because they are on ridgetops and far from the farm buildings. But poorer soil of the valleys continue to be worked because they are close to the farm buildings. For example large areas of Mardin, Culvers, and Cookport soils that are acid and only moderately well drained are valued higher as potato soils than the better drained Bath, Lackawanna, and Cattaraugus soils that are in forest. On many of the soils, lumbering is important, and on others oil and gas concessions are in force.

The size and number of farms in the county vary. The large areas of forest in the county influence the size of farms. Because many farms have large wood lots, the farms of the county are among the largest in the State. In 1950 the farms of Potter County were grouped by size as follows:

Size of farms in acres:	*Number*
1,000 or more	5
500 to 999	44
260 to 499	190
220 to 259	67
180 to 219	141
140 to 179	145
100 to 139	201
70 to 99	130
50 to 69	86
30 to 49	30
10 to 29	60
Less than 10	57

The area of Potter County in farms has decreased since 1930. In that year 234,367 acres, or about 34.2 percent of the county, was in farms. In 1940 the acreage in farms had fallen to 212,515, or 30.4 percent, and in 1950 it was 205,501, or 29.4 percent.

Crops

The leading crops in Potter County are hay, oats, potatoes, and corn for silage (table 4). Wheat, buckwheat, and barley are also grown, but their combined acreage does not equal the acreage in oats. Vegetable crops—mainly peas and beans—occupied about 1,000 acres in 1950. Apples, plums, cherries, and pears are grown, but the area is not well suited to these crops.

Permanent and Rotation Pastures

Except for two general areas where Volusia and Mardin soils predominate (see fig. 3), the soils of Potter County are not naturally suitable for pasture. The Volusia soils are best for pasture because they contain limy material from the Chemung formation in amounts sufficient to make them less acid than soils developed from other formations. Only moderately heavy applications of lime and light applications of nitrogen and phosphorus are needed for good pastures on Volusia soils. Pasture that will graze a cow per acre from May to October can be established without much difficulty. Dairies therefore are more common around Harrison Valley, Mills, Shinglehouse, and Sharon than elsewhere in the county.

TABLE 4. — *Acreages of principal crops and number of bearing fruit trees*

Crop	1929	1939	1949
	Acres	*Acres*	*Acres*
Corn:			
Harvested for grain	205	564	772
Cut for silage or fodder, hogged, or grazed	2,373	3,068	2,287
Small grains:			
Oats, threshed or combined	9,007	9,838	7,670
Wheat	59	153	1,116
Barley	603	311	82
Buckwheat	4,374	2,529	1,005
Hay:			
Clover and timothy, alone or mixed	40,695	25,692	23,610
Alfalfa	117	180	313
Small grains cut for hay	318	308	495
Other tame hay	2,086	3,807	(1)
Wild hay	1,228	94	(1)
Irish potatoes	3,775	3,360	[2] 3,341
Green peas	1	(1)	555
Green beans, seed, string, wax	3	(1)	497
Strawberries and other small fruit	16	16	5
	Number [3]	*Number* [3]	*Number* [3]
Apple trees	57,667	25,874	14,850
Cherry trees	650	98	121
Pear trees	2,033	757	521
Plum and prune trees	1,196	214	151

[1] Not reported.
[2] Excludes acres for farms with less than 15 bushels harvested.
[3] Number, in the census year, which is 1 year later than crop year given at the head of the column.

Most of the other pastures of the county are permanent pastures that need attention. They should be cleared, seeded, limed, and topdressed with nitrogen and superphosphate. Furthermore the weeds should be kept mowed. Large applications of lime, phosphorus, and nitrogen are needed on most of the soils of the county to obtain the best growth of pasture plants. The nitrogen can be in the form of manure or commercial fertilizer.

The total land in pasture in Potter County decreased from 94,639 acres in 1944 to 75,121 acres in 1949. During this period woodland pasture decreased from 42,254 to 30,723 acres, and pasture not woodland or cropland decreased from 46,117 to 31,744 acres. But from 1944 to 1949 cropland used for pasture increased from 6,268 to 12,654 acres. This increase of cropland used for pasture and decrease of woodland and other pasture indicate that cropland is being converted to pasture, and that the poor pastures of the woodlands and brushy land are becoming timberland.

Livestock and Livestock Products

Dairy cattle, some cattle raised for meat, and sheep are the main livestock in Potter County. Since 1930 the number of dairy cattle has remained at about 15,000, but the number of sheep has declined. Recent indications are that the number of sheep is increasing. The number of chickens, like the number of cattle, has been about constant since 1930. Because of the in-

creased use of tractors, the number of horses in the county has declined. Fewer swine are raised now than were raised in the past.

Following are the numbers of livestock of all ages in Potter County in 1950:

	Number
Cattle	15,276
Cows milked	8,529
Chickens	61,160
Sheep	3,217
Horses	1,340
Swine	1,103

Holstein is the dominant breed of dairy cattle in the county. Herefords are the most prevalent beef cattle, but there are some Angus. A few herds of Ayrshire or Jersey and some grade herds of Jersey, Ayrshire, and Guernsey cattle are milked.

On about one-quarter of the farms, the cattle are bred by artificial insemination. The rest of the farms use either the registered bull service of the dairyman's association or bulls of their own.

Hampshire is the dominant breed of sheep, and some Suffolk and Chevoit crossbreeds are kept. Berkshire and Yorkshire are the leading breeds of hog. Most of the sheep are purebred, but the swine are mostly crossbred.

Leghorns make up most of the large flocks of chickens raised for eggs. Rhode Island Reds are raised for meat. Some White or Barred Rocks and a few other breeds, such as New Hampshire Reds and Buff Orpingtons, are raised in small flocks.

One commercial fish farm in Odin raises rainbow and brook trout.

Milk, eggs, and wool are the principal livestock products. Following is the amount of milk and eggs sold and wool shorn in 1946:

		Number
Whole milk	pounds	48,265,706
Eggs	dozens	511,689
Wool	pounds	13,491

Most of the milk is sold to creameries to be processed into condensed milk and cheese. The rest is sold locally or in the villages. Eggs are sold to truckers who pick them up in case lots and take them to Buffalo, N. Y., or to Philadelphia. Wool is sold locally to buyers who come in at shearing time and bid on the wool when it is shorn.

Lime and Fertilizer

Most of the soils of Potter County are acid and for good crop yields need large initial applications of lime. Figure 11 divides the county into areas according to general acidity and gives guides for initial application of finely ground limestone. Some soils that have liming requirements different from the general suggestions occur in these areas. The actual need of any soil for lime should be determined by soil tests.

Much of the lime used is finely ground limestone, but hydrated or burned lime is also applied. Most of the limestone is spread directly from trucks supplied by the merchant.

Experiments conducted by Pennsylvania State University on potatoes, oats, and clover and timothy hay indicate a serious deficiency of nitrogen in all except a few of the soils in Potter County. Supplies of available phosphorus, potassium, and magnesium range from moderately low to high.

Fertilizer formulas commonly used in the county at the time of survey were low or only moderately high in nitrogen. For all fields except those in hay or pasture, the mixtures normally used were 4–12–12, 5–10–10, or 6–12–6. Hay and pasture receive manure and 20-percent superphosphate. The most common fault in fertilization was not applying enough nitrogen.

Farm Facilities and Equipment

In the 1950 census, farm facilities and equipment were reported as follows:

Farms reporting—	Number
Telephones	798
Electricity	1,090
Electric water pump	520
Electric hot-water heater	245
Home freezer	276
Electric washing machine	995
Electric chick brooder	221
Electric power feed grinder	15
Milking machines	472
Grain combines	113
Corn pickers	5
Pick-up hay balers	45
Upright silos	438
Pit or trench silos	5
Motortrucks	555
Tractors	665
Wheel tractors other than garden	645
Garden tractors	20
Crawler tractors	58
Automobiles	775

Considering that there were 1,156 farms in the county in 1950, the foregoing list shows that about two-thirds of the farms have electricity, that more than a third have motortrucks and tractors, and that nearly a third have silos. The number of milking machines and silos reported are an indication of the importance of dairying in the county.

Use and Management of Soils

Management Groups

Each soil of Potter County has individual characteristics that affect its use suitability and management, but many soils are much alike in their management needs. To simplify the discussion of use and management, the soils of the county are placed in 14 groups, and some of the groups are subdivided into two or more subgroups. This classification is made according to the characteristics of the soils that affect their use and management. The main characteristics that affect the soils of this county are stoniness, slope, drainage, and depth to a rock ledge or a relatively impervious layer.

The managements groups, the soils that compose each group, the common crops grown on these soils, and suggested management practices are given in table 5. A map showing the management groups in color is found at the end of this report.

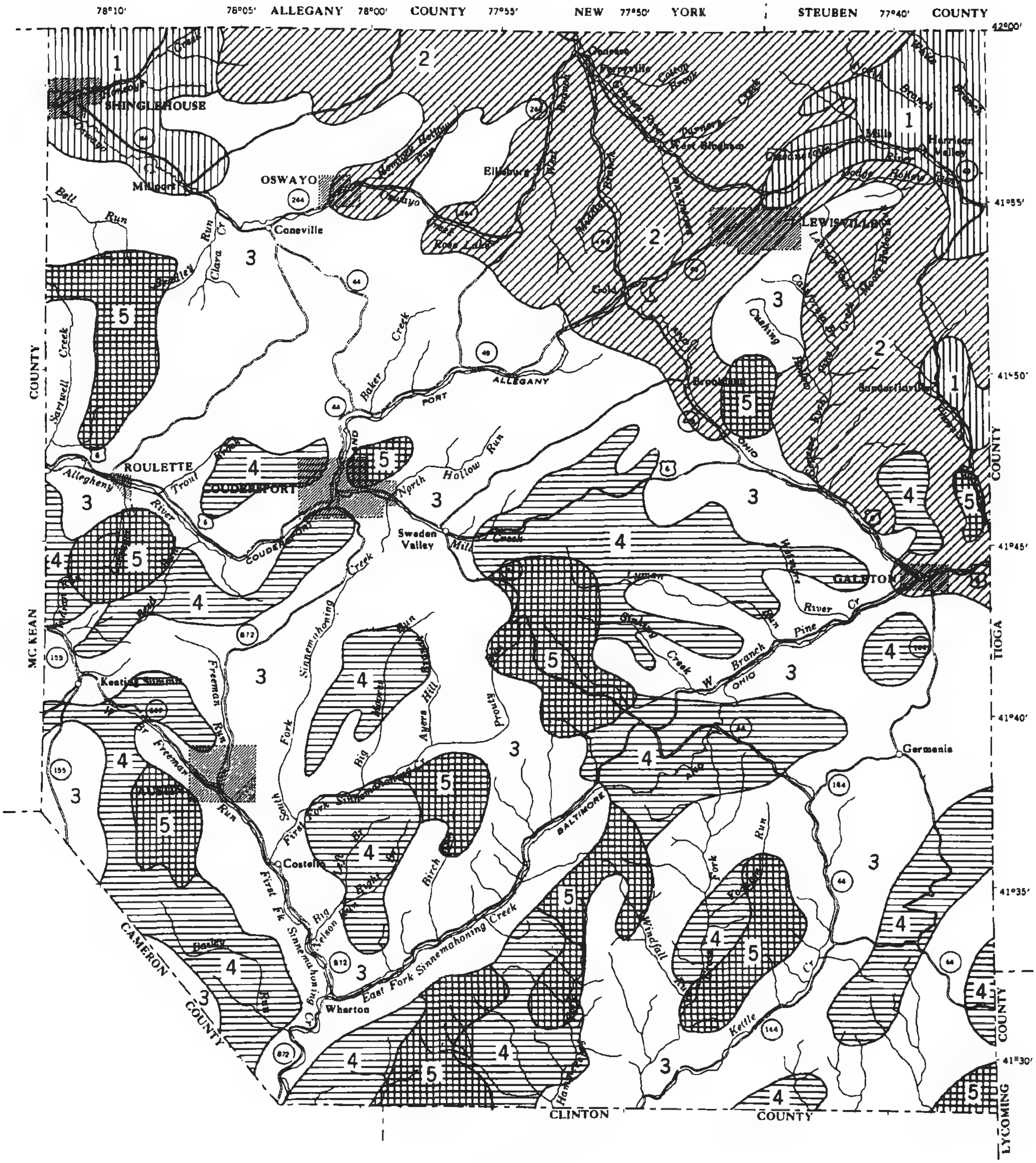
78°10'
78°05'
ALLEGANY
78°00'
COUNTY
77°55'
NEW
77°50'
YORK
STEUBEN
77°40'
COUNTY
42°00'
41°55'
41°50'
41°45'
41°40'
41°35'
41°30'
SHINGLEHOUSE
Millport
OSWAYO
Coneville
Ellisburg
Genesee
LEWISVILLE
Gold
Brookland
Harrison Valley
ROULETTE
COUDERSPORT
Sweden Valley
GALETON
Germania
Keating Summit
Costello
Wharton
Bell Run
Bradley Run
Clara Cr
Sartwell Creek
Allegheny River
Trout Run
Baker Creek
Allegany
Port
North Hollow Run
Mill Creek
Lyman Run
Pine Cr
W Branch
Ohio
Sinnemahoning
Freeman Run
Ayers Hill
Prouty
Birch
Baltimore
East Fork Sinnemahoning Creek
First Fk Sinnemahoning Cr
Windfall
Kettle Cr
Fork Run
Cushing
Oswayo
Hammersley
COUNTY
MC KEAN
CAMERON
COUNTY
CLINTON
COUNTY
TIOGA
COUNTY
LYCOMING
COUNTY
1
2
3
4
5

Figure 11.

Explanation for figure 11.

***Figure 11.*—Potter County, Pa., divided into areas of general acidity, and guides for initial application of finely ground limestone.**

1. **Very acid to alkaline. Lime should be applied as indicated by specific soil tests. Initial application may vary from 1.0 to 3.0 tons per acre. Potatoes are not generally grown.**
2. **Medium acid. Initial application at least 1.0 ton per acre for most crops. Amount can be reduced for potatoes but should be increased for alfalfa and peas.**
3. **Strongly acid. Initial application at least 2.0 tons per acre for most crops. Amount can be reduced for potatoes but should be increased for alfalfa and peas.**
4. **Very strongly acid. Initial application at least 3.0 tons per acre for most crops. Alfalfa and peas not generally grown in these areas.**
5. **Extremely acid. If cultivated, initial application of at least 4.5 tons per acre will be required.**

The soils of management groups 1 to 6 make up most of the agricultural land of Potter County. Much of the cultivated land consists of group 1 soils. Almost all the cropland used for potatoes, corn, small grains, peas, and beans consists of soils of management groups 1, 3, 4, and 5. Most of the soils used for pasture, hay, and small grains are in group 3 and subgroup 4B. The soils of groups 5, 7, and 11 are used mostly for orchards, hay, and pasture—uses that require only limited cultivation. The soils of all other groups are suited mainly to forest.

Management group 1.—The soils of this group are on the uplands and terraces. They are deep and very deep, well drained, medium to moderately coarse textured, and level to sloping.

These soils are well suited to most crops of the area, and they can be used for hay, pasture, and cane fruits. Serious erosion is not a problem on the cultivated soils, because the slopes are generally less than 12 percent, and the average slope is between 5 and 10 percent. In some areas, however, the mild slopes reduce air drainage and increase the danger of frost damage. These areas of poor air drainage are less suited to orchards than the more sloping soils.

Management group 2.—The soils of this group are on the uplands. They are deep and moderately deep, well drained to somewhat excessively drained, moderately coarse textured, and level to sloping.

The slopes of these soils are not more than 12 percent, and normally serious erosion is not a problem. Because most of the soils of this group are somewhat shallow and have a thin topsoil, erosion losses should be kept to a minimum and the topsoil improved. The soils of this group require contour tillage or stripcropping and cover and green-manure crops. Furthermore, rotations should be longer than those on the soils of group 1. Some of the soils of group 2 are somewhat excessively drained and droughty. For some crops it is beneficial to use organic mulches and to plow under cover crops so that the water-holding capacity of the soils will be increased.

Management group 3.—The soils of this group are on the uplands and terraces. They are deep and moderately deep, moderately well drained, medium textured, and level to sloping.

No soil of this group is sufficiently drained. The slopes are generally not more than 8 percent, and internal drainage is slow. These soils are better suited to pasture, hay, small grains, and corn than to peas, potatoes, orchard fruits, or other crops that require well-drained soils. The drainage of some of these soils can be improved with tile drains and diversion terraces. If drainage is improved, most of the soils of this group are suited to all crops of the area.

Management group 4.—The soils of this group are on the bottom lands. They are deep, medium textured to moderately coarse textured, and well drained to moderately well drained. Soils of group 4 are subdivided into two subgroups according to drainage. Well-drained soils are placed in subgroup 4A, and moderately well drained soils in subgroup 4B.

Soils of subgroup 4A are likely to be flooded in spring, but, after the water recedes, they are well suited to the crops of the area and to hay, pasture, and cane fruits. Because of their location on the bottom lands and consequent lack of sufficient air drainage, the soils are not well suited to orchards.

Like the soils of subgroup 4A, the moderately well drained soils of subgroup 4B are subject to spring floods. But, because the internal drainage of the soils of subgroup 4B is impaired, they do not dry out so readily as those of subgroup 4A. Therefore 4B soils are better suited to pasture and hay than to other crops or orchards. Diversion terraces along the upland and tile drain in places of sufficient slope will sometimes improve soils of subgroup 4B so that they can be used for row crops. If the soils are used for row crops, corn and beans do better than peas and potatoes.

The high-bottom phases in group 4, which are in both subgroups, are less likely to be flooded than other soils of the group. They can be cultivated most of the year. Because the slopes of all these soils are not more than 3 percent, sheet erosion is not a problem. The soils, however, are subject to some cutting and gouging by streams.

Management group 5.—The soils of this group are on the uplands and terraces. They are deep and very deep, well drained, medium textured, and moderately sloping.

Most of the soils of this group have slopes that range from 12 to 20 percent, and if cultivated these soils are subject to some erosion. Soils of group 5 are well suited to all crops commonly grown in the area. They are particularly well suited to orchards because good air drainage reduces the hazard of frost damage. Erosion on these soils is more prevalent than on the soils of groups 1 to 4, and control measures are necessary. On most of the slopes, contour tillage and stripcropping will prevent soil losses; but the more erodible soils of this group need long rotations and cover crops.

Management group 6.—The soils of this group are on the uplands. They are deep and moderately deep, moderately well drained, medium textured, and sloping.

The internal drainage of these soils is medium or slow, but external drainage is adequate because of the dominant 8 to 15 percent slopes. Diversion terraces are particularly effective. They often improve drain-

TABLE 5. — *Use and management suggestions and capability*

Management group and subgroup and soils	Capability class and Subclass [1]	Suitable crops [2]
Management group 1—Deep and very deep, well-drained, medium to moderately coarse textured, level to sloping soils of the uplands and terraces:		
Bath channery silt loam, 0 to 12 percent slopes	IIe	Potatoes, oats, barley, buckwheat, wheat, millet, corn, canning peas, snap beans, soybeans, alfalfa, cucumbers, broccoli, cauliflower, red clover, timothy, birdsfoot trefoil, orchard fruits.
Cattaraugus channery loam, 0 to 12 percent slopes	IIe	
Chenango gravelly loam, 0 to 12 percent slopes	IIe	
Clymer channery loam, 0 to 12 percent slopes	IIe	
Germania silt loam, 0 to 12 percent slopes	IIe	
Lackawanna channery loam, 0 to 12 percent slopes	IIe	
Lackawanna channery silt loam, 0 to 12 percent slopes	IIe	
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 0 to 12 percent slopes	IIe	
Lordstown channery silt loam, neutral variant, 0 to 30 percent slopes	IIe	
Sweden loam, 0 to 12 percent slopes	IIe	
Tunkhannock gravelly loam, 0 to 12 percent slopes	IIe	
Unadilla fine sandy loam, 0 to 3 percent slopes	I	
Unadilla silt loam, 0 to 3 percent slopes	I	
Vrooman fine sandy loam, 0 to 3 percent slopes	I	
Vrooman silt loam, 0 to 3 percent slopes	I	
Woostern gravelly loam, 0 to 12 percent slopes	IIe	
Management group 2—Deep and moderately deep, well-drained and somewhat excessively drained, moderately coarse textured, level to sloping soils of the uplands:		
Dekalb channery loam, 40 or more inches deep, 0 to 12 percent slopes	IIs	Potatoes, oats, buckwheat, pasture, apples.
Dekalb fine sandy loam, 0 to 12 percent slopes	IIs	
Dilldown sandy loam, 0 to 12 percent slopes	IIs	
Management group 3—Deep and moderately deep, moderately well drained, medium-textured, level to sloping soils of the uplands and terraces:		
Braceville gravelly silt loam, 0 to 5 percent slopes	IIe	Meadow crops, birdsfoot trefoil, oats, barley, corn, potatoes, pasture. Note: Peas and orchard fruits are not generally suited to these soils.
Cookport channery loam, 0 to 8 percent slopes	IIe	
Culvers channery silt loam, 0 to 8 percent slopes	IIe	
Mardin channery silt loam, 0 to 8 percent slopes	IIe	
Scio fine sandy loam-silt loam, 0 to 3 percent slopes	IIe	
Wellsboro channery silt loam, 0 to 8 percent slopes	IIe	
Wharton channery silt loam, 0 to 12 percent slopes	IIe	
Management group 4—Deep, well-drained and moderately well drained, medium to moderately coarse textured soils of the bottom lands:		
4A: *Well-drained soils:*		
Barbour fine sandy loam, 0 to 3 percent slopes	IIw	Corn, small grains, meadow crops, pasture, peas, and vegetables.
Barbour fine sandy loam, high bottom phase, 0 to 3 percent slopes	I	
Barbour gravelly fine sandy loam, 0 to 3 percent slopes	IIw	
Tioga fine sandy loam, 0 to 3 percent slopes	IIw	
Tioga fine sandy loam, high bottom phase, 0 to 3 percent slopes	I	
Tioga gravelly loam, 0 to 3 percent slopes	IIw	
4B: *Moderately well drained soils:*		
Basher sandy loam, 0 to 3 percent slopes	IIw	Pasture and meadow crops, including birdsfoot trefoil; corn, oats, and wheat. Note: Peas are not suited to these soils.
Basher silt loam, 0 to 3 percent slopes	IIw	
Basher silt loam, high bottom phase, 0 to 3 percent slopes	IIw	
Middlebury sandy loam, 0 to 3 percent slopes	IIw	
Middlebury silt loam, 0 to 3 percent slopes	IIw	
Middlebury silt loam, high bottom phase, 0 to 3 percent slopes	IIw	
Management group 5—Deep and very deep, well-drained, medium-textured, moderately sloping soils of the uplands and terraces:		
Bath channery silt loam, 12 to 20 percent slopes	IIIe	Potatoes, small grain, corn, timothy and red clover for hay or pasture, orchard fruits, cane fruits, black and red raspberries, peas, and other vegetables.
Cattaraugus channery loam, 12 to 20 percent slopes	IIIe	
Chenango gravelly loam, 12 to 20 percent slopes	IIIe	
Clymer channery loam, 12 to 20 percent slopes	IIIe	
Germania silt loam, 12 to 20 percent slopes	IIIe	
Lackawanna channery loam, 12 to 20 percent slopes	IIIe	
Lackawanna channery silt loam, 12 to 20 percent slopes	IIIe	
Lackawanna channery silt loam, residual variant, 25 to 40 inches deep, 12 to 20 percent slopes	IIIe	
Tunkhannock gravelly loam, 12 to 20 percent slopes	IIIe	
Woostern gravelly loam, 12 to 20 percent slopes	IIIe	

See footnotes at end of table.

classes for soils of Potter County, Pa.

Suitable rotations [3]	Fertilizer requirement	Lime requirement	Other management practices needed, and remarks
Short intensive rotations: Potatoes, small grain, and red clover for 1 or 2 years. Potatoes, and small grains for 2 years. Potatoes, red clover, and oats. Corn, oats, potatoes, hay for 2 years, and oats. Hay for 1 to 3 years, and a vegetable crop. Corn, potatoes, or a vegetable crop, hay for 1 to 2 years, and oats.	All soils require nitrogen, phosphorus, and potassium; some may also require trace elements such as boron and manganese; if in doubt as to nutrients needed, soil tests should be made.	Individual fields should be tested and limed accordingly; normally about 2 tons of ground limestone per acre for first application.	Cultivate on the contour and stripcrop the more sloping parts of field; sidedressings of nitrogen for corn and topdressing for oats and wheat are normally effective; apply 6 to 10 tons of well decomposed manure per acre on fields to be planted to corn or vegetables.
Long rotations of row crops followed by cover crop or hay: Potatoes or corn, hay for 2 to 3 years, and a small grain. Vegetables and hay for 1 to 2 years, and potatoes (rye).	Same as for group 1 except normally more fertilizer is needed.	Same as for group 1 except the initial application of lime should be 3 tons or more per acre except where potatoes are in the rotation.	Same as for group 1; apples may require top dressing of 5 to 7 pounds of nitrogen per tree in addition to manure and mulch.
Short rotations that include 2 or 3 years of small grain: Potatoes, hay, and oats for 2 years. Corn, a small grain, and hay for 2 years.	Same as for group 1	Same as for group 1	Same as group 1 and drainage; diversion terraces and tile drains are often needed for the wet spots.
Short rotations with intensive cultivation of vegetables: Vegetables for 2 years, a small grain, and hay for 1 year. Corn, potatoes or a vegetable crop, and oats.	Same as for group 1	Same as for group 1, but 1 ton of lime per acre may be enough for initial application.	Flooding in spring may delay planting; overflow protection when feasible, and diversion terraces along the upland will often help keep fields tillable.
Corn, hay for 2 years, small grain for 1 or 2 years, and hay. Where subject to frequent flooding, keep in pasture or omit corn from rotation.	Same as for group 1	Apply lime liberally to pastures and hayfields: 1 to 2 tons of finely ground limestone per acre every 3 years.	Subject to flooding in spring; protection from overflow needed; diversion terraces along upland is sometimes effective.
Potatoes, a small grain, and hay for 2 years. Corn, a small grain, and red clover for 2 years. Vegetables, red clover, and a small grain.	Same as for group 1 but somewhat more fertilizer is normally needed to offset losses from leaching and runoff; orchards may require additional nitrogen as topdressing.	Same as for group 1	To reduce erosion and runoff use contour cultivation, stripcropping, and, in places, terracing.

TABLE 5. — *Use and management suggestions and capability*

Management group and subgroup and soils	Capability class and Subclass [1]	Suitable crops [2]
Management group 6—Deep and moderately deep, moderately well drained, medium-textured, sloping soils of the uplands:		
Cookport channery loam, 8 to 15 percent slopes	IIIe	Potatoes, small grains, corn, pasture and hay, including birdsfoot trefoil. Note: Peas and orchard fruits are not generally suitable.
Culvers channery silt loam, 8 to 15 percent slopes	IIIe	
Mardin channery silt loam, 8 to 15 percent slopes	IIIe	
Wellsboro channery silt loam, 8 to 15 percent slopes	IIIe	
Wharton channery silt loam, 12 to 20 percent slopes	IIIe	
Management group 7—Shallow to very shallow, well-drained and somewhat excessively drained, medium to moderately coarse textured, gently sloping to strongly sloping soils of the uplands:		
Dekalb channery loam, 10 to 25 inches deep, 0 to 12 percent slopes	IIs	Pasture, cane fruits, hay, small grain. Note: Soils generally too thin and droughty for row crops; best suited to pasture and cane fruits.
Dekalb channery loam, 10 to 25 inches deep, 12 to 20 percent slopes	IIIe	
Dekalb channery loam, 40 or more inches deep, 12 to 20 percent slopes	IIIe	
Dekalb fine sandy loam, 12 to 20 percent slopes	IIIe	
Dilldown sandy loam, 12 to 30 percent slopes	IIIe	
Lordstown channery silt loam, 0 to 12 percent slopes	IIs	
Lordstown channery silt loam, 12 to 20 percent slopes	IIIe	
Minora silt loam, 0 to 12 percent slopes	IIs	
Minora silt loam, 12 to 20 percent slopes	IIIe	
Oquaga channery loam, 0 to 12 percent slopes	IIs	
Oquaga channery loam, 12 to 20 percent slopes	IIIe	
Management group 8—Shallow and deep, poorly and very poorly drained, medium-textured, level to strongly sloping soils of the uplands:		
8A: *Poorly drained nonflaggy soils:*		
Brinkerton and Armagh silt loams, 0 to 15 percent slopes	IVe	Pasture and hay, including birdsfoot trefoil. Note: Peas, orchard fruits and all crops requiring good drainage are not suitable; small grains are suitable if soils are drained.
Cavode channery silt loam, 0 to 8 percent slopes	IIIe	
Cavode channery silt loam, 8 to 15 percent slopes	IIIe	
Cavode silt loam, 0 to 8 percent slopes	IIIe	
Cavode silt loam, 8 to 15 percent slopes	IIIe	
Morris silt loam, 0 to 3 percent slopes	IIIw	
Morris silt loam, 3 to 8 percent slopes	IIIe	
Morris silt loam, 8 to 15 percent slopes	IIIe	
Nolo channery silt loam, 0 to 8 percent slopes	IVe	
Volusia channery silt loam, 0 to 3 percent slopes	IVw	
Volusia channery silt loam, 3 to 8 percent slopes	IVe	
Volusia channery silt loam, 8 to 15 percent slopes	IVe	
8B: *Poorly drained flaggy soils:*		
Volusia flaggy silt loam, 0 to 8 percent slopes	IVe	Forest and pasture
Volusia flaggy silt loam, 8 to 15 percent slopes	IVe	
8C: *Very poorly drained soils:*		
Chippewa silt loam, 0 to 8 percent slopes	VIw	Forest and pasture
Norwich silt loam, 0 to 15 percent slopes	VIw	
Management group 9—Moderately deep and deep, poorly and very poorly drained, medium-textured, nearly level soils of the bottom lands and terraces:		
Holly sandy loam, 0 to 3 percent slopes	VIw	Pasture and forest (hemlock, white pine, spruce, larch, willow, and maple).
Holly silt loam, 0 to 3 percent slopes	VIw	
Mixed alluvium, 0 to 5 percent slopes	VIw	
Papakating silt loam, 0 to 3 percent slopes	VIw	
Peat and muck, undifferentiated, 0 to 3 percent slopes	VIIIw	
Red Hook silt loam, 0 to 3 percent slopes	IIIw	
Management group 10—Moderately shallow to deep, poorly and very poorly drained, level to strongly sloping soils of the uplands:		
10A: *Nonstony soils:*		
Cavode channery silt loam, 15 to 25 percent slopes	IIIe	Forest (hemlock, white pine, spruce, larch, willow, and maple), pasture, and hay.
Cavode silt loam, 15 to 25 percent slopes	IIIe	
Morris silt loam, 15 to 25 percent slopes	IVe	
Volusia channery silt loam, 15 to 25 percent slopes	IVe	
10B: *Stony soils:*		
Cavode stony silt loam, 0 to 15 percent slopes	VIw	Forest, pasture, and hay
Chippewa stony silt loam, 0 to 8 percent slopes	VIw	
Morris stony silt loam, 0 to 15 percent slopes	VIw	
Morris stony silt loam, 15 to 25 percent slopes	VIIw	
Nolo stony sandy loam, sandy variant, 0 to 12 percent slopes	VIw	
Norwich stony silt loam, 0 to 15 percent slopes	VIw	
Volusia flaggy silt loam, 15 to 25 percent slopes	IVe	

See footnotes at end of table.

classes for soils of Potter County, Pa.—Continued

Suitable rotations [3]	Fertilizer requirement	Lime requirement	Other management practices needed, and remarks
Potatoes, oats, and red clover for 2 years. Corn, oats, and red clover for 2 years. Potatoes, and hay for 2 years.	Same as for group 1 but more fertilizer is normally needed.	Same as for group 1	Same as for group 3, except tile drains normally are not needed.
If cultivated, long rotations and cover crops for green manure should be used to maintain organic matter and reduce erosion: Corn, and hay for 2 to 3 years. Corn, oats, and red clover for 2 years.	Same as for group 1 but more fertilizer is normally needed.	See group 1; these soils are very strongly acid and require initial applications of 3 tons of finely ground limestone per acre.	Soils generally thin and droughty; because slopes are generally too strong, irrigation is not practical.
Generally not suitable for tilled crops; use for hay continuously; when stand needs reseeding, small grains or corn can be used: Hay for 1 to 3 years, corn, and oats if soil has been drained.	Manure and lime needed on pastures and hayfields; add complete fertilizer according to need shown by soil tests.	See group 1; soils require about 2 tons of finely ground limestone per acre as initial application.	Soils generally too poorly drained for intertilled crops; on some fields tile drains and diversion terraces will improve drainage enough for corn, potatoes, and beans.
Not suitable for crops	None if forested; same as for group 8A if in pasture.	None if forested; same as for group 8A if in pasture.	Too poorly drained and too flaggy for intertilled crops; tile drains and diversion terraces will improve the drainage enough to permit improvement of pasture.
Not suitable for tilled crops; same areas suited to pasture.	None unless drained; same as for 8A if in pasture or hay.	Same	Diversion terraces often can be used to advantage on pasture.
Not suitable for tilled crops	Same as for group 8A	Initial applications of 2 to 3 tons of lime normally needed; test periodically to determine need for lime.	Mow pastures for control of weeds and graze heavily in early part of year; diversion terraces often desirable; forestry program that includes patch cutting and clear cutting of mature stands needs to be developed.
Continuous pasture or hay; not suitable for tilled crops.	If in pasture or hay, fertilization based on soil tests is suggested; pastures respond to manure.	Apply lime heavily to pastures; initial application should be based on soil tests.	Clear and mow pastures; forestry program of selective, patch, and rotation cutting is suggested.
If forested should remain in forest.	Same	Same	Same.

TABLE 5. — *Use and management suggestions and capability*

Management group and subgroup and soils	Capability class and Subclass [1]	Suitable crops [2]
Management group 11—Moderately steep, medium to moderately coarse textured, stone-free and stone-cleared soils of the uplands and terraces:		
11A: *Very deep to moderately deep, well or moderately well drained soils:*		
Bath channery silt loam, 20 to 30 percent slopes	IVe	Forest, pasture, meadow, orchards, cane fruits, and small grains.
Cattaraugus channery loam, 20 to 30 percent slopes	IVe	
Clymer channery loam, 20 to 30 percent slopes	IVe	
Cookport channery loam, 15 to 25 percent slopes	IVe	
Culvers channery silt loam, 15 to 25 percent slopes	IVe	
Germania silt loam, 20 to 30 percent slopes	IVe	
Lackawanna channery loam, 20 to 30 percent slopes	IVe	
Lackawanna channery silt loam, 20 to 30 percent slopes	IVe	
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 20 to 30 percent slopes.	IVe	
Tunkhannock flaggy loam, 20 to 30 percent slopes	IVe	
Wellsboro channery silt loam, 15 to 25 percent slopes	IVe	
Wharton channery silt loam, 20 to 30 percent slopes	IVe	
Woostern gravelly loam, 20 to 30 percent slopes	IVe	
11B: *Very deep and deep, somewhat excessively drained soils:*		
Chenango gravelly loam, 20 to 50 percent slopes	IVe	Same
Dekalb channery loam, 40 or more inches deep, 20 to 30 percent slopes	IVe	
Dekalb fine sandy loam, 20 to 30 percent slopes	IVe	
11C: *Very deep, moderately well drained soils:*		
Mardin channery silt loam, 15 to 25 percent slopes	IVe	Same as subgroup 11A, except that orchards are not suited.
11D: *Shallow, well drained soils:*		
Dekalb channery loam, 10 to 25 inches deep, 20 to 30 percent slopes	IVe	Forest
Lordstown channery silt loam, 20 to 30 percent slopes	IVe	
Minora silt loam, 20 to 30 percent slopes	IVe	
Oquaga channery loam, 20 to 30 percent slopes	IVe	
Management group 12—Deep or shallow, level to strongly sloping, medium to moderately coarse textured, somewhat excessively to moderately well drained, stony or flaggy soils of the uplands and terraces:		
Cattaraugus stony loam, 0 to 20 percent slopes	VIs	Forest and pasture
Clymer stony loam, 0 to 20 percent slopes	VIs	
Cookport stony loam, 0 to 15 percent slopes	VIs	
Culvers stony silt loam, 0 to 15 percent slopes	VIs	
Dekalb stony loam, 10 to 25 inches deep, 0 to 20 percent slopes	VIs	
Dekalb stony loam, 40 or more inches deep, 0 to 20 percent slopes	VIs	
Lackawanna stony loam, 0 to 20 percent slopes	VIs	
Leetonia stony loamy sand, 0 to 20 percent slopes	VIs	
Lordstown stony loam, 0 to 20 percent slopes	VIs	
Oquaga stony loam, 0 to 20 percent slopes	VIs	
Sweden stony loam, 0 to 12 percent slopes	VIs	
Tunkhannock flaggy loam, 3 to 20 percent slopes	IIIe	
Wellsboro stony loam, 0 to 15 percent slopes	VIs	
Management group 13—Shallow to deep, moderately steep or steep, somewhat excessively to moderately well drained soils of the uplands:		
13A: *Stony soils:*		
Cattaraugus stony loam, 20 to 30 percent slopes	VIs	Forest and pasture
Clymer stony loam, 20 to 30 percent slopes	VIs	
Cookport stony loam, 15 to 25 percent slopes	VIs	
Cookport stony loam, 25 to 50 percent slopes	VIs	
Culvers stony silt loam, 15 to 25 percent slopes	VIs	
Culvers stony silt loam, 25 to 35 percent slopes	VIs	
Dekalb stony loam, 10 to 25 inches deep, 20 to 30 percent slopes	VIs	
Dekalb stony loam, 40 or more inches deep, 20 to 30 percent slopes	VIs	
Lackawanna stony loam, 20 to 30 percent slopes	VIs	
Leetonia stony loamy sand, 20 to 30 percent slopes	VIs	
Lordstown stony loam, 20 to 30 percent slopes	VIs	
Oquaga stony loam, 20 to 30 percent slopes	VIs	
Wellsboro stony loam, 15 to 25 percent slopes	VIs	
Wellsboro stony loam, 25 to 35 percent slopes	VIs	

See footnotes at end of table.

classes for soils of Potter County, Pa.—Continued

Suitable rotations [3]	Fertilizer requirement	Lime requirement	Other management practices needed, and remarks
Forest or pasture is best suited to the steeper slopes; most fields are too steep for intertilled crops; fields with lower slopes are suited to long rotations that include a sod crop most of the time: Hay continuously until reseeding is needed, then oats, wheat, or buckwheat as nurse crops. Hay for 2 to 4 years, and a small grain. Corn, and hay for 1 to 2 years.	Same as for group 6	Same as for group 1; for pasture see group 10.	Only a few of the soils in this group are suitable for occasional tillage; fields in tilled crops should be farmed with contour strips; forestry program of patch cutting and rotation cutting is desirable.
Same	Same	Same	Same.
Same	Same	Same	Same.
Not suited to tilled crops	If in pasture, fertilize according to soil tests.	If in pasture, lime according to soil tests.	Forestry program of selective, patch, and rotation cutting; areas in pasture should be kept in pasture.
Not suitable for tilled crops unless cleared of stones.	Same as for group 6	Heavy applications of lime needed on pastures; initial application should be based on soil tests.	See subgroup 11A for pasture; a continuous program of hardwood selective cuttings in mature stands is suggested; many soils could be cleared of stones and trees and cultivated to crops.
Not cultivated; generally too steep for clearing.	Same as for group 6	Same as for group 1	Same as for group 11A for pasture; selective, patch, and rotation cutting for forest according to the stand and rate of growth.

TABLE 5. — *Use and management suggestions and capability*

Management group and subgroup and soils	Capability class and Subclass [1]	Suitable crops [2]
13B: *Nonstony or stone-cleared soils:*		
Bath channery silt loam, 30 to 40 percent slopes	VIe	Pasture, and forest; forest areas should remain in forest; suitable for pasture, if adequately fertilized and erosion controlled.
Cattaraugus channery loam, 30 to 40 percent slopes	VIe	
Culvers channery silt loam, 25 to 35 percent slopes	VIe	
Dekalb channery loam, 40 or more inches deep, 30 to 40 percent slopes	VIe	
Germania silt loam, 30 to 50 percent slopes	VIs	
Lackawanna channery loam, 30 to 40 percent slopes	VIe	
Lackawanna channery silt loam, 30 to 40 percent slopes	VIe	
Lordstown channery silt loam, 30 to 40 percent slopes	VIe	
Mardin channery silt loam, 25 to 35 percent slopes	VIe	
Wellsboro channery silt loam, 25 to 35 percent slopes	VIe	
Woostern gravelly loam, 30 to 50 percent slopes	VIe	
Management group 14—Shallow to deep, very steep soils of the uplands and terraces:		
14A: *Stony, very stony, and flaggy soils:*		
Cattaraugus and Lackawanna stony loams, 30 to 60 percent slopes	VIIe	Forest
Cavode stony silt loam, 15 to 50 percent slopes	VIIe	
Leetonia and Dekalb very stony soils, 0 to 20 percent slopes	VIIIs	
Leetonia and Dekalb very stony soils, 20 to 30 percent slopes	VIIIs	
Leetonia and Dekalb very stony soils, 30 to 70 percent slopes	VIIIs	
Morris stony silt loam, 25 to 50 percent slopes	VIIe	
Oquaga stony loam, 30 to 60 percent slopes	VIIe	
Tunkhannock flaggy loam, 30 to 50 percent slopes	VIIe	
14B: *Stone-cleared soils:*		
Brinkerton and Armagh silt loams, 15 to 50 percent slopes	VIIe	Forest: Forest area should remain in forest; cleared areas suited to pasture if adequately fertilized.
Cattaraugus and Lackawanna channery loams, 40 to 60 percent slopes	VIIe	
Culvers and Wellsboro channery silt loams, 35 to 50 percent slopes	VIIe	
Leetonia channery loamy sand and Dekalb channery loam, 30 to 60 percent slopes	VIIe	
Lordstown and Bath channery silt loams, 40 to 60 percent slopes	VIIe	
Morris silt loam, 25 to 50 percent slopes	VIIe	
Oquaga channery loam, 30 to 50 percent slopes	VIIe	
Volusia channery silt loam, 25 to 40 percent slopes	VIIe	

[1] See section, Capability Classes and Subclasses.
[2] Crops commonly grown in the county in 1949 and 1950 according to sample of 122 farms.

age enough to allow use of the soils for almost all the crops of the area, including orchard crops. The soils of group 6, however, are normally better suited to small grains, corn, and hay than to other crops. By ridging the fields, the soils are made suitable for potatoes, and this crop is widely grown. Erosion may be somewhat active, and the soils may require contour tillage, stripcropping, and cover crops.

Management group 7.—The soils of this group are on the uplands. They are shallow to very shallow, well to excessively drained, medium to moderately coarse textured, and gently to strongly sloping.

The slopes of these soils range from 12 to 20 percent, and there are many ledges in the fields. Because of the strong slopes and thin topsoil, these soils are very likely to erode. They are better suited to pasture, orchards, cane fruits, and hay than to row crops. If cultivated, long rotations, stripcropping, contour tillage, and cover crops are required to maintain the topsoil. Even under these management practices, however, yields are normally low because the soils of this group tend to be droughty. Soils of group 7 are also extremely acid. They need at least a ton more of finely ground limestone on an acre than the soils of groups 1 to 6.

Management group 8.—The soils of this group are on the uplands. They are shallow to deep, poorly to very poorly drained, medium textured, and level to strongly sloping.

These soils occur mainly along the gently sloping to strongly sloping lower valley walls and interstream areas. They are subject to seepage, ponding, or a high water table. Artificial drainage is particularly difficult, and the soils are not suited to tilled crops. All of the soils of group 8 require heavy applications of lime for good yields. They are not suitable for apples and peas. The soils are used extensively for pasture and hay, and, when drained, some of the soils are well suited to this use.

This management group is divided into three subgroups, according to drainage and flagginess: 8A, poorly drained nonflaggy soils; 8B, poorly drained flaggy soils; and 8C, very poorly drained soils.

The soils of subgroups 8A and 8B can be used for pasture, hay, and small grains. Some soils of groups 8A and 8B, if sufficiently drained, can be used for corn. The soils of subgroup 8B require that stones and flagstones be removed if grain and corn are to be grown. The soils of subgroup 8C normally are ponded much of the time and, if cleared at all, can be used only for pasture.

Management group 9.—The soils of this group are on the bottom lands and terraces. They are moderately deep to deep, poorly to very poorly drained, medium textured, and nearly level.

All the soils of group 9 are saturated much of the time and are better suited to pasture and forest than to any other use. This management group includes

classes for soils of Potter County, Pa.—Continued

Suitable rotations [3]	Fertilizer requirement	Lime requirement	Other management practices needed, and remarks
Not generally suited to row crops.	Same as for group 6	Same as for group 1	Same.
Not cultivated; too steep and stony for clearing.			Forestry program of selective, patch, and rotation cutting.
Not generally suited to crops	Same as for group 6	Same as for group 1	Same as for group 13A.

[3] Rotations commonly used in 1949 and 1950, according to sample of 122 farms.

peat and muck deposits. These deposits may be used to a small extent as mulch for plants or as organic soil amendments for greenhouses. Many of the soils occur in seepage areas around springs and cannot be drained successfully. These soils are well suited to use for pond sites, provided a sufficient catch basin is available.

Management group 10.—The soils of this group are on the uplands and terraces. They are moderately shallow to deep, poorly drained and very poorly drained, and level to strongly sloping. The soils of this group are subdivided into two subgroups according to stoniness. Nonstony soils are placed in subgroup 10A, and stony soils in subgroup 10B. The soils of group 10 are wet, sloping, and stony, or they are wet and steep. Some of them can be used for pasture and hay, but they are best suited to forestry.

Management group 11.—The soils of this group are on the uplands and terraces. They are moderately steep, medium to moderately coarse textured, and stone free or stone cleared. They range from moderately well drained to excessively drained.

The soils of this group are placed in four subgroups according to depth and drainage: 11A, very deep to moderately deep, well to moderately well drained soils; 11B, very deep and deep, somewhat excessively drained soils; 11C, very deep, moderately well drained soils; and 11D, shallow, somewhat excessively drained to well drained soils.

The soils of these subgroups have slopes that range from 15 to 30 percent, but the dominant slope range is 20 to 30 percent. These slopes are generally too steep for cultivation. Otherwise, the soils would be suited to most crops of the area. If they were cultivated, long rotations, stripcropping, contour tillage, and, possibly, terracing would be necessary to maintain the topsoil. The soils of subgroups 11A, 11B, and 11C are best used for pasture, hay, cane fruits, and orchards. The soils of subgroup 11D are best suited to forests.

Management group 12.—The soils of this group are on the uplands and terraces. They are deep or shallow, level to strongly sloping, medium to moderately coarse textured, somewhat excessively drained to moderately well drained, and stony and flaggy.

Soils of group 12 have stones on the surface that hinder cultivation. But slopes are not more than 20 percent, and some of the soils, if cleared of trees and stones, are well suited to the crops of the area. Except for some pastures and idle land, these stony soils are all forested. Some of the idle land could be used for cane fruits and orchards without further stone removal. The best use for the soils of the group, however, is forest.

Management group 13.—The soils of this group are on the uplands. They are shallow to deep, moderately steep or steep, and somewhat excessively drained to moderately well drained.

Soils of group 13 are placed in two subgroups according to stoniness. Stony soils are placed in subgroup 13A, and nonstony or stone-cleared soils in subgroup 13B.

The moderately steep stony soils of subgroup 13A are generally in forest, and they cannot be economically cleared and cultivated. A few acres of the nonstony, steep soils have been cleared and are in pasture, hay, or orchards. Runoff is rapid, and the soils are droughty.

Management group 14.—The soils of this group are on the uplands. They are very steep and shallow to deep. The soils have been placed into two subgroups according to stoniness and flagginess. Soils of subgroup 14A are stony, very stony, or flaggy. Those of subgroup 14B are stone cleared.

Except for a few acres of very steep, stone-cleared soil in pasture, all soils of group 14 are in forest. Slopes are as steep as 70 percent, but dominant slopes are between 40 and 60 percent. Stoniness is frequently so severe that the growth of trees is impeded. Many of the very stony and very steep soils consist mainly of rock material that has undergone little soil formation.

Capability Classes and Subclasses

A soil should be managed to overcome natural limitations, or hazards, to its use. These hazards may be small or great. They may be of several kinds, such as erosion, wetness, or dryness. Management therefore depends both on the degree and on the kind of hazard that should be overcome.

A system of grouping that places soils in eight classes has been devised to show relative suitability of soils for use. This system is called land-capability classification. Because it is based both on the degree and the kind of hazard, the system is a guide to management. All soils are grouped in eight land-capability classes and as many as four subclasses.

The soils of classes I, II, and III are suited to some of the tilled crops commonly grown in the area. Hazards and management needs are successively greater on the soils of class II and class III than they are on those of class I.

The soils of class IV are less suited to a regular cropping system than the soils of the first three classes. But part of the time, some class IV soils can be used for tilled crops with special practices. The soils of these first four classes generally are well suited to pasture, and in this county to orchards and forest.

Soils on which hazards are so great that cultivation is not practicable are placed in classes V, VI, VII, and VIII. Class V is not used in Potter County. It contains soils that are nearly level and not subject to erosion, but too wet, too frequently overflowed, or too stony for cultivation.

The soils of class VI are more limited by one or more hazards than those of class IV. But class VI soils will produce forage, orchard crops, and forest products.

Soils in class VII are more limited in their use than those in class VI. Generally the natural cover can be managed for grazing or forestry. The succession of plants generally can be at least partly controlled. The choices of management are fewer than on soils of class VI.

Class VIII consists of soils so severely limited that they produce little useful vegetation. They may provide attractive scenery or a habitat for wildlife. Some make up parts of watersheds in which runoff should be controlled.

SUBCLASSES: Each of the eight classes contains soils that have management needs of about the same degree. But within a single class the soils may have different kinds of hazards. The soils in one class therefore require different kinds of management. To show the different kinds of limitation within a class, subclasses are used.

Four dominant kinds of hazards determine the four subclasses in the capability system. These hazards are indicated by small letters as follows:

(e) Erosion if cover is not maintained.
(w) Excess water either in or on the soil.
(s) Shallow, droughty, or unusually infertile soil.
(c) Unusually hazardous climate (not used in this county).

A description of the land capability classes and subclasses of Potter County follows. The classification of each soil mapping unit is shown in table 5.

Class I.—Deep, well-drained, medium-textured soils on nearly level slopes that have little or no erosion hazard; suited to sustained intensive cultivation if good farming practices are used to maintain organic matter and fertility.

Class II.—Soils suited to cultivation that have only moderate erosion hazard or other natural limitation.

IIe: Soils with moderate erosion hazard under cultivation; suited to continued use if contour stripcropping, diversion of water from long slopes, or similar simple practices for erosion control are followed.

IIw: Soils with slightly impeded natural drainage that are seasonably wet and not suited to some sensitive crops.

IIs: Soils that are somewhat droughty because of shallowness or sandiness.

Class III.—Soils suited to cultivation that have moderately severe erosion hazard or other serious natural limitations.

IIIe: Moderately sloping soils that have serious erosion hazard and must be carefully managed; management must include contour stripcropping, diversion of water from long slopes, and use of sod crops in the rotation; subclass also contains soils that have both erosion hazard and restricted natural drainage.

IIIw: Nearly level or gently sloping soils with poor or somewhat poor drainage; if used for most crops, soils need artificial drainage.

Class IV.—Soils that are suited only to limited or occasional cultivation.

IVe: Moderately steep soils with severe erosion hazard; soils need close-growing plant cover and should be cultivated only occasionally.

Class VI.—Soils that are too steep, too wet, or too stony for cultivation; suited to pasture or forest if moderate care is taken to control erosion.
- VIe: Steep soils with severe erosion hazard.
- VIw: Nearly level, poorly drained soils that are difficult to drain because of frequent flooding, slow movement of water through the soil, stoniness, or a combination of these.
- VIs: Level to moderately steep, stony soils that are too stony to plow, but which can be used for pasture.

Class VII.—Soils with serious hazards or limitations even if used for pasture and forest.
- VIIe: Soils too steep or too stony to allow normal use for pasture.
- VIIw: Poorly drained, strongly sloping, stony soils.

Class VIII.—Soils that are not suited to crops, pasture, or commercial forest.
- VIIIw: Small areas of organic soils on which drainage is not practical.
- VIIIs: Extremely bouldery and ledgy areas that have limited use for forest but provide some food and shelter for wildlife.

The class and subclass of each soil in Potter County is given with management suggestions in table 5, because the capability grouping is so intimately related to management.

Estimated Yields

Yields range widely on the soils of Potter County. Table 6 gives estimated average yields of the principal crops for some soils that are in management groups 1 through 7. These yields indicate, in a general way, the productivity range for the arable soils of the county. For the soils listed, the yields are from an analysis based on reports from 122 farms, observations in the field, and reports of results on experimental plots of the State agricultural experiment station. The soils in management groups 8 through 14 have only a limited acreage under cultivation and yields for these soils are not available.

Yields for the crops on the various soils have a wide range, but within each group the average yields from 122 farm records reflect the critical soil characteristics. On soils in group 1, for example, the average yield of potatoes was 365 bushels per acre; group 2, 300 bushels; group 3, 320 bushels, and group 4A, 375 bushels; group 5, 335 bushels; and group 6, 290 bushels per acre. Groups 7 to 14 inclusive do not include soils on which potatoes are generally raised.

Morphology and Genesis of Soils

The soils of Potter County occur on the following deposits: (1) Glacial till and sand and gravel of Wisconsin age deposited by glacial melt water; (2) Wisconsin frost-worked (periglacial) materials; (3) residuum from sedimentary rocks; (4) older alluvium, colluvium, and terrace deposits that are probably of pre-Wisconsin age; and (5) alluvial and terrace deposits along the present streams. Figure 12 (p. 66) shows the location of these main surficial formations.

Figure 12 does not show alluvial and terrace deposits along the present streams, nor a few scattered depressions that contain some organic deposits. These deposits are chiefly muck, but one has some fibrous peat in its lower part.

The sedimentary rocks in the area are sandstone, siltstone, conglomerate, and small amounts of coal and calcareous rock. In addition to the fragments of local sedimentary rocks, the glacial till contains a few pebbles, cobbles, and boulders of gneiss, granite, and chert from rock formations that occur north of Potter County.

Based on the active soil-forming processes and the properties of the resulting horizons, the soils of Potter County can be grouped into broad classes. The following classification is based on the scheme outlined in the 1938 Yearbook of Agriculture, Soils and Men (*14*), as modified by papers on soil classification in the February 1949 issue of Soil Science (*2*):

Order	*Great soil group*
Zonal soils	Podzol.
	Gray-Brown Podzolic.
	Red-Yellow Podzolic.
	Brown Forest.
Intrazonal soils	Low-Humic Gley.
	Humic Gley.
Azonal soils	Alluvial.

In table 7, page 70, the soil series are arranged by drainage class, according to kind of parent material and great soil group.

Figure 13, page 68 shows the location of representative soil profiles in the county.

Podzol Soils

Most of the well-drained and moderately well drained soils of Potter County are Podzols. Leetonia stony loamy sand is a Podzol that has strongly developed genetic horizons. This soil type occurs just west of Austin on top of the plateau and on Clara Hill in Pleasant Valley.

Leetonia stony loamy sand was derived from the coarsest sandstone and conglomerate in the county. It is normally confined to the top of the plateau, where these formations are most widespread. Well developed in profile, the soil has several inches of the gray or white leached layer (bleicherde) that characterizes Podzols. Immediately below the leached layer is a dark-brown, or coffee-colored, cemented layer (ortstein or orterde). Ortstein is extremely hard when dry, and orterde is weakly cemented and brittle when dry. The ortstein or orterde is underlain by the loose brownish-yellow sand of the parent material.

The following is a profile description of Leetonia stony loamy sand in woods:

A_{00} 2 to 0 inch, loose litter of leaves, twigs, and plants.
A_1 0 to 1 inch, black (10YR 2/1), loose, extremely acid coarse loamy sand; weak coarse granular structure.
A_2 1 to 10 inches, white (10YR 8/2), very loose, structureless, extremely acid coarse sand (bleicherde).
B_{21} 10 to 14 inches, brown (7.5YR 5/2) loamy coarse sand, somewhat stained with strong brown; cemented (ortstein); extremely acid.

TABLE 6. — *Estimated average yields of principal crops on some selected soils from management groups 1 through 7*

[Estimates based on records from 122 farms, notes made by the author, and results on experimental plots of the State agricultural experiment station]

Soils	Corn		Potatoes	Hay			Oats	Wheat	Peas	Green beans	Buckwheat	Barley
	Silage	Shelled grain		Timothy and clover	Clover	Alfalfa and clover [1]						
	Tons	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*
Management group 1:												
Bath channery silt loam, 0 to 12 percent slopes.	10	40	405	1.0	2.5	2.0	55					
Cattaraugus channery loam, 0 to 12 percent slopes.	13	70	440	1.5	1.5	2.5	55	50	1.7	2.5	20	
Chenango gravelly loam, 0 to 12 percent slopes.			375	1.5	2.7		60					
Clymer channery loam, 0 to 12 percent slopes.			275	.5			25				20	
Lackawanna channery loam, 0 to 12 percent slopes.	15	60	400	1.5			45	40				
Lackawanna channery silt loam, 0 to 12 percent slopes.	12		360	1.2		2.0	50	40				35
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant 0 to 12 percent slopes.		20	300	1.0			35					
Sweden loam, 0 to 12 percent slopes	8		275	1.0			40					
Tunkhannock gravelly loam, 0 to 12 percent slopes.		50	400	1.5		2.0	65	40	2.0	3.0		
Unadilla fine sandy loam, 0 to 3 percent slopes.		50	375	1.5	2.0	2.7	60	40				
Unadilla silt loam, 0 to 3 percent slopes		60		2.0	3.0	2.5	60	40				
Vrooman fine sandy loam, 0 to 3 percent slopes.	14	50	430	1.5			40					
Woostern gravelly loam, 0 to 12 percent slopes.			350	1.5			60					
Management group 2:												
Dekalb fine sandy loam, 0 to 12 percent slopes.			350		1.0		30					
Management group 3:												
Cookport channery loam, 0 to 8 percent slopes.			275	1.0			30					
Culvers channery silt loam, 0 to 8 percent slopes.	12	60	350	2.0			50		1.0	1.5		50
Mardin channery silt loam, 0 to 8 percent slopes.	10		345	1.5	2.0	2.5	45					
Scio fine sandy loam-silt loam, 0 to 3 percent slopes.	14	50	350	2.5	3.0	4.0	30					
Wellsboro channery silt loam, 0 to 8 percent slopes.	12		275			2.0	40	30				
Management subgroup 4A:												
Barbour fine sandy loam, 0 to 3 percent slopes.		50		1.5		3.0	35	30				
Barbour fine sandy loam, high bottom phase, 0 to 3 percent slopes.		50		1.5		2.5	35	30				
Barbour gravelly fine sandy loam, 0 to 3 percent slopes.		35		1.0			45					
Tioga fine sandy loam, 0 to 3 percent slopes.		40		1.5			50	30				
Tioga fine sandy loam, high bottom phase, 0 to 3 percent slopes.		50	375			2.5	60	50				
Management subgroup 4B:												
Basher sandy loam, 0 to 3 percent slopes				2.0			40					
Basher silt loam, high bottom phase, 0 to 3 percent slopes.		40		2.0	2.0		35					
Management group 5:												
Bath channery silt loam, 12 to 20 percent slopes.	10	25	300	.7	1.0		50	30		1.5		
Cattaraugus channery loam, 12 to 20 percent slopes.	10		290	1.7			45	24				50
Chenango gravelly loam, 12 to 20 percent slopes.	12	35	375	1.5	2.5	3.0		50	1.5	3.0		
Lackawanna channery silt loam, 12 to 20 percent slopes.	12		360	1.5	2.0	2.0	50	40				35

See footnote at end of table.

TABLE 6. — *Estimated average yields of principal crops on some selected soils from management groups 1 through 7—Continued*

Estimates based on records from 122 farms, notes made by the author, and results on experimental plots of the State agricultural experiment station]

Soils	Corn		Potatoes	Hay			Oats	Wheat	Peas	Green beans	Buckwheat	Barley
	Silage	Shelled grain		Timothy and clover	Clover	Alfalfa and clover [1]						
	Tons	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*
Management group 5:—Continued												
Lackawanna channery silt loam, 25 to 40 inches deep, 12 to 20 percent slopes.	8	25	300	1.0	------	------	35	------	------	------	------	------
Tunkhannock gravelly loam, 12 to 20 percent slopes.	------	50	375	1.5	2.5	2.5	65	35	------	------	------	------
Management group 6:												
Cookport channery loam, 8 to 15 percent slopes.	------	------	275	1.0	------	------	30	------	------	------	------	------
Culvers channery silt loam, 8 to 15 percent slopes.	10	------	330	2.0	3.0	3.0	46	20	------	------	------	------
Mardin channery silt loam, 8 to 15 percent slopes.	------	20	300	1.0	2.0	1.5	50	35	------	------	------	------
Wellsboro channery silt loam, 8 to 15 percent slopes.	7	------	275	1.5	2.0	2.0	55	------	------	------	------	------
Management group 7:												
Lordstown channery silt loam, 0 to 12 percent slopes.	5	------	250	.5	------	------	30	------	------	------	------	------
Oquaga channery loam, 0 to 12 percent slopes.	8	20	250	.5	------	------	25	25	------	------	30	------

[1] Includes birdsfoot trefoil.

B_{22} 14 to 22 inches, dark-brown (7.5YR 3/2 to 4/4), weakly cemented and hard loamy coarse sand (orterde); extremely acid; structureless.

C 22 to 32 inches, brownish-yellow (10YR 6/8), loose, coarse sand; structureless; extremely acid.

D_r 32 inches to undetermined depth, weathered gray and pale-yellow conglomerate and sandstone of the Pottsville formation.

The average depth of the Leetonia soil profile is about 32 inches, but the depth to unweathered rock may be 50 inches.

The Leetonia, Dekalb, Chenango, and Woostern soils have yellowish-brown soil material. Podzolization is generally more pronounced on these soils than on soils that contain brown and red soil materials. But podzolization is well advanced on certain red soils in Potter County, as, for example, Dilldown sandy loam. Like other Podzols, Dilldown sandy loam has prosome of the frost-worked deposits of Potter County nounced A_2 and B_2 layers. It has developed from red, medium-grained sandstone. The most extensive soils in the county are weakly developed Podzols.[9] These weak Podzols commonly have a gray leached layer, normally 1 to 2 inches thick, but in some profiles this layer may be lacking. The strong-brown upper part of the underlying B horizon generally does not have the cementation of strong Podzols, and it is commonly only 2 to 4 inches thick. In cultivated fields the gray layer is mixed with the upper subsoil and cannot be recognized.

The Lackawanna is a principal series among the weakly developed Podzols. Lackawanna soils have developed partly from glacial till and partly from accumulations of frost-worked local rock materials that are chiefly from red sandstones and shales. In Potter County many of the frost-worked deposits are extremely flaggy or channery. These materials described by Denny (7) range from a few feet to as much as 9 feet or more in thickness. In many places the angular and subangular fragments of local rock have a random orientation that is not related to the dip and strike of the bedrock. In other places fragments are arranged as if they had been forced vertically into the ground and they are frequently tilted upward at approximately similar angles. In other areas stones are arranged in circular patterns called stone or boulder rings (7). These conditions are mainly manifestations of frost action.

Except that the rounded pebbles are scarce and the erratics of igneous and metamorphic rock are lacking, resemble glacial till. In many places the parent material is compact or very firm loam and in some places it is a clay loam.

Following is a description of Lackawanna channery silt loam in a cultivated field:

A_{p3} 0 to 3 inches, dark reddish-brown (5YR 3/2), very strongly acid, friable channery silt loam; strong coarse granular structure.

A_{p1} 3 to 7 inches, dark reddish-brown (2.5YR 3/4), very strongly acid, friable channery silt loam; medium granular structure.

B_{21} 7 to 15 inches, dark reddish-brown (2.5YR 3/3), very strongly acid, moderately firm channery silt loam; moderately weak fine subangular blocky structure.

B_{22} 15 to 28 inches, dusky-red (2.5YR 3/2), very strongly acid, firm channery silt loam; weak medium subangular blocky structure.

C 28 inches +, dusky-red (2.5YR 3/2), very firm, very strongly acid, channery silt loam; strong medium subangular blocky structure.

[9] Field studies in 1956 indicate that the soils classed here as weak Podzols may be in the Sols Bruns Acides great soil group.

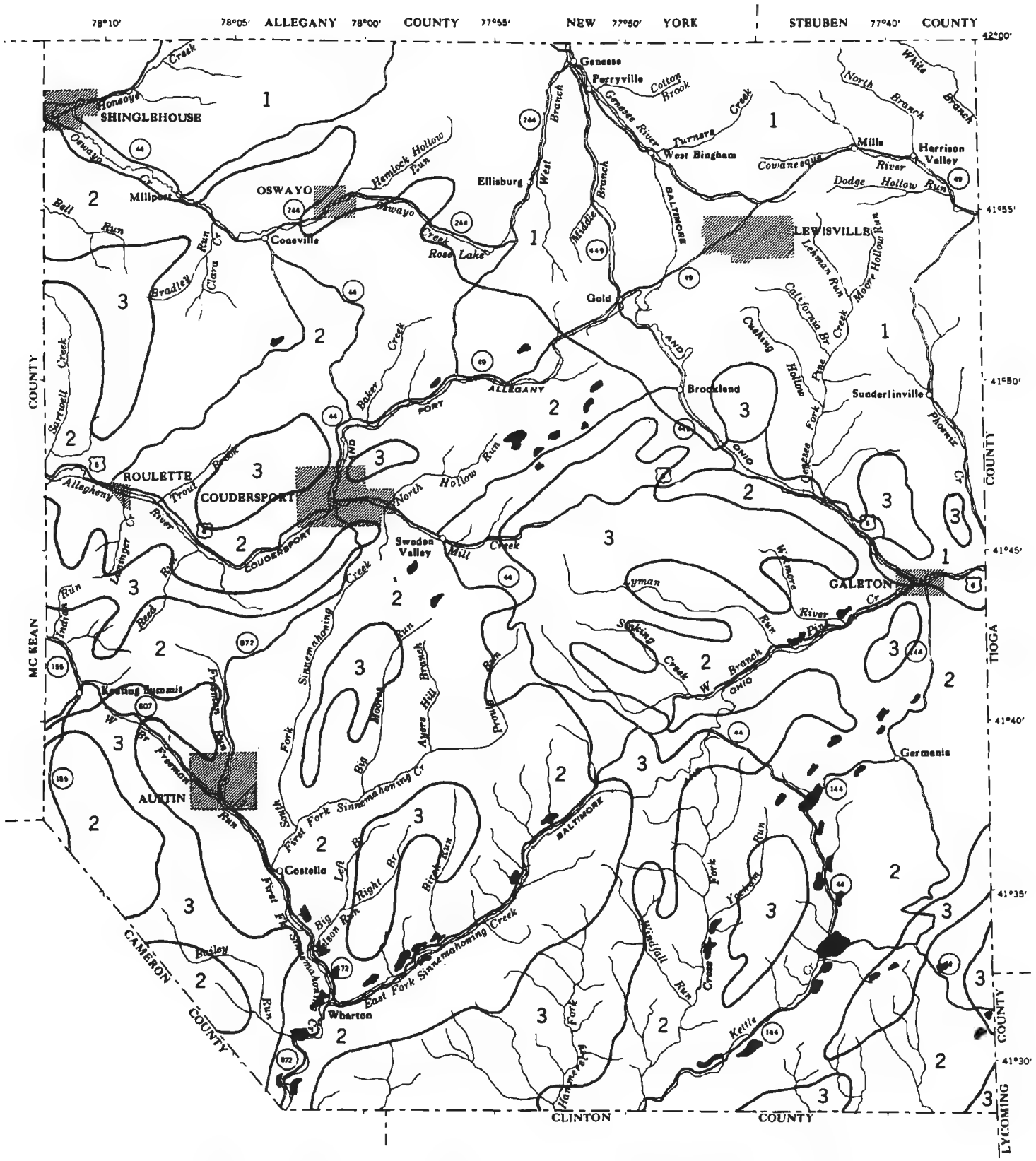

Figure 12.—**Principal areas of soil parent material in Potter County, Pennsylvania.**

Explanation for figure 12.

1. **Wisconsin glacial till: Unassorted mixture of materials ranging from the size of clay particles to boulders many feet in diameter; materials derived from local bedrock and contain a few pebbles, cobbles, and boulders from igneous and metamorphic rocks that occur outside the county; small areas of frost-worked deposits and residuum included.**
2. **Periglacial deposits: Largely unassorted mixtures of materials derived from local bedrock; materials commonly channery, flaggy, or stony.**
3. **Residuum: Unassorted mixture of materials derived from underlying bedrock, generally thinner than the periglacial deposits; content of rock fragments increases with depth; bedrock normally at depths of less than 6 feet.**

Black spots (not numbered): Older (probably pre-Wisconsin) alluvium, colluvium, and residuum; soils have clay and clay loam matrix, yellowish-red subsoils, and many deeply weathered and soft fragments of rocks.

C_2 Parent material a massive clay loam soil matrix that contains large flagstones and smaller fragments of olive-green, gray, and reddish siltstones and fine sandstones of the Catskill formation; very firm and extremely hard when dry; depth to bedrock at least 10 feet.

Other well-drained weak Podzols are the Bath, Cattaraugus, Lordstown, Oquaga, Tunkhannock, Unadilla, and Vrooman soils.

Culvers, Wellsboro, Mardin, Braceville, and Scio soils are moderately well drained, weak Podzols. They have some mottling and a noticeable increase in the percentage of silt and clay in the lower subsoil. This lower subsoil is dense or compact and very firm and brittle. The following profile description of Wellsboro channery silt loam shows this condition.

A_p 0 to 5 inches, dark reddish-gray (5YR 4/2), moderately loose, strongly acid channery silt loam; medium strong fine granular structure.

B_{21} 5 to 12 inches, red (2.5YR 4/8), friable, strongly acid channery loam; medium strong fine granular structure.

B_{22} 12 to 22 inches, weak-red (10R 4/4), firm and brittle, very strongly acid silt loam; weak fine subangular blocky structure.

B_{23gm} 22 to 28 inches, mottled weak-red (2.5YR 4/4) and reddish-brown (5YR 5/4) medium to strongly acid fine sandy clay loam; very firm, brittle; strong thick platy or medium subangular blocky structure.

B_{24gm} 28 to 42 inches, mottled red and light reddish-brown (2.5YR 4/6 and 5/4), medium acid fine sandy clay loam; very firm, brittle; strong thick platy structure.

C_1 42 inches +, slightly mottled weak-red (10R 4/4 and 5/6) very firm, medium acid fine sandy clay loam; weak medium subangular blocky structure; sandy clay loam grades into somewhat compact, medium acid, reddish glacial till that contains a few pebbles and cobbles of igneous and metamorphic rocks or into strongly acid till-like periglacial deposits; depth to bedrock at least 10 feet.

The Mardin soils are similar to the Wellsboro. The genesis and morphology of the Mardin and Volusia soils have been studied in detail by Carlisle (*3*) who has proposed a different horizon nomenclature than the one given in the description of the Wellsboro series.

Table 8 gives average data obtained from chemical analysis of 13 profiles of well-drained Podzol soils, the Bath, Cattaraugus, and Lackawanna, and of 3 profiles of moderately well drained Podzol soils, the Culvers, Mardin, and Wellsboro. Data for the B_{21} horizon is not shown in this table, because the B_{21} horizon is considered to be completely incorporated in the A_p horizon.

Gray-Brown Podzolic Soils

The well-drained Clymer and Minora soils are in the Gray-Brown Podzolic great soil group (*13*). They have a friable 8- to 10-inch A_2 horizon of granular or fine platy structure. This A_2 horizon is leached and paler in color than the underlying B_2 horizon, which is of well-defined, angular and subangular structure. Some clay has accumulated in the B_2 horizon, and the layer is more sticky and firm than the A_2.

The unplowed wooded areas of the Gray-Brown Podzolic soils have a sequence of Podzol horizons (bleicherde and orterde) in the upper 3 to 5 inches. Where the soil has been cleared and plowed, the micropodzol characteristics have been destroyed, but below plow depth the main features that characterize these soils as Gray-Brown Podzolic remain unchanged.

Compared with the Gray-Brown Podzolic soils that have developed in other regions from a parent material high in lime, the Gray-Brown Podzolic soils of Potter County have a low content of bases.

The Cookport and Wharton are moderately well drained Gray-Brown Podzolic soils. The Cavode soils are also in this group, but they are somewhat poorly drained. Cookport soils have a dense, very firm, brittle pan layer in the lower subsoil, and a dense, firm pan also occurs in the Wharton and Cavode subsoil. The pan in the Wharton and Cavode, however, is much higher in clay content and more plastic and sticky than the pan in the Cookport. This high clay content is derived, at least in part, from the clay shales on which the Wharton and Cavode soils developed.

A profile description of Cavode silt loam follows:

A_0 2 to 0 inches, dark-brown and black accumulations of rotted forest debris.

A_{p2} 0 to 3 inches, very dark brown (10YR 3/2), very strongly acid, friable or slightly plastic silt loam; strong medium granular structure; pale-yellow leached layer (bleicherde), ½ inch thick, at the top of this horizon.

B_{21} 3 to 10 inches, brownish-yellow (10YR 6/8), very strongly acid, firm silt loam or silty clay loam; moderately strong fine granular structure.

B_{22g} 10 to 23 inches, intensely mottled gray, yellow, and brown, very firm or very plastic, very strongly acid silty clay; strong coarse subangular blocky structure.

B_{23g} 23 to 29 inches, intensely mottled gray and yellow, extremely firm or very plastic, very strongly acid, silty clay; strong coarse subangular blocky structure; many shale fragments in the lower part.

C_g 29 to 32 inches, intensely mottled gray and yellow, very hard or very plastic, very strongly acid shaly silty clay; strong thick platy structure.

Red-Yellow Podzolic Soils

The Sweden soils have characteristics of two kinds of soils—the weak Podzols of Potter County, and the Red-Yellow Podzolic soils of the southeastern United States (*8*). The sandier upper portion of Sweden soils is a frost-worked deposit, in which a Podzol profile has formed. The surface soil is light textured, fri-

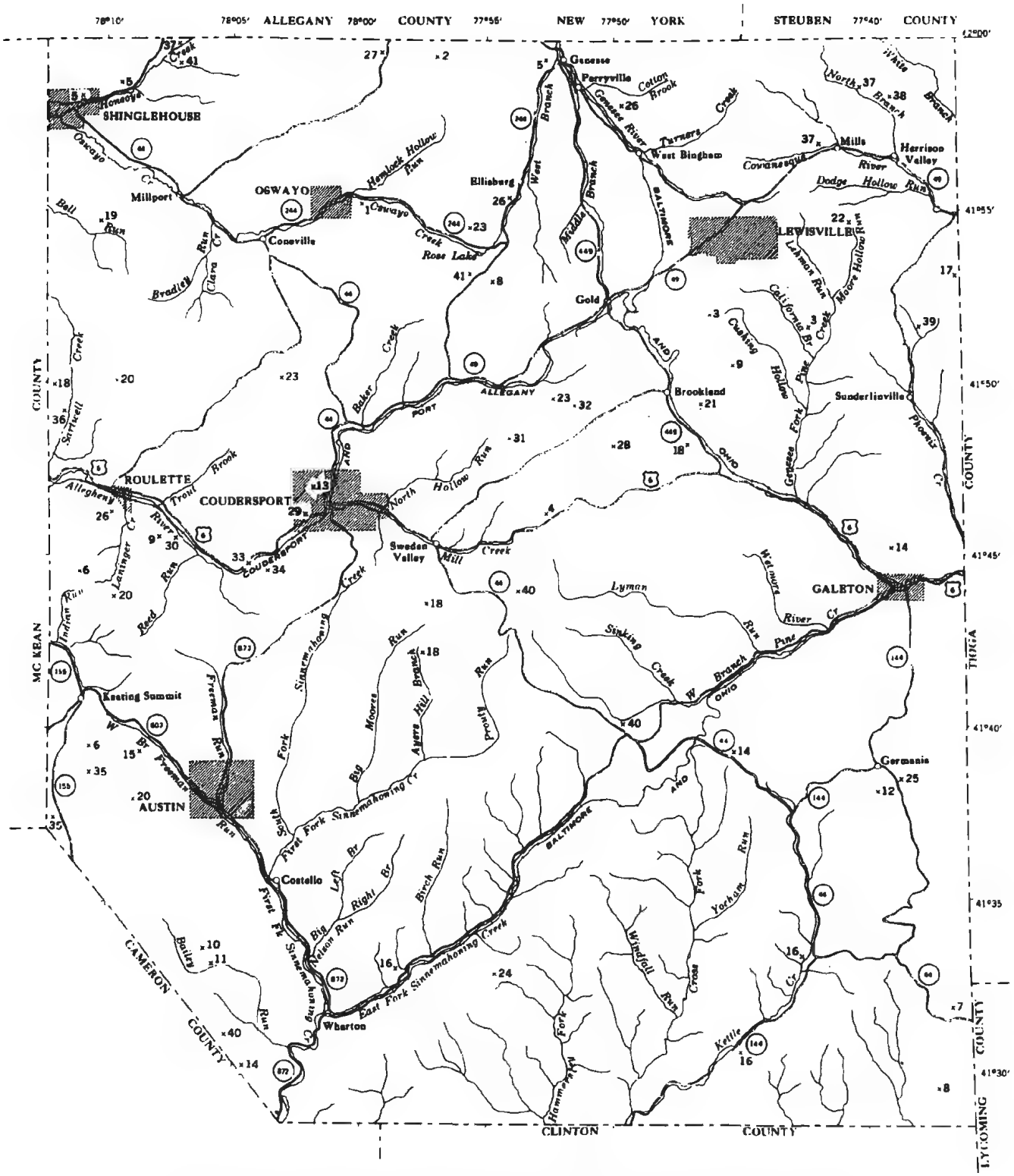

Figure 13.—Location of representative soil profiles in Potter County, Pennsylvania.

Explanation for figure 13.

1. Barbour gravelly fine sandy loam.
2. Bath channery silt loam.
3. Cattaraugus channery loam.
4. Cavode silt loam.
5. Chenango gravelly loam.
6. Chippewa silt loam.
7. Clymer channery loam.
8. Cookport channery loam.
9. Culvers channery silt loam.
10. Dekalb channery loam, 10 to 25 inches deep.
11. Dekalb stony loam, 10 to 25 inches deep.
12. Dekalb channery loam, 40 or more inches deep.
13. Dekalb fine sandy loam.
14. Dekalb stony loam, 40 or more inches deep.
15. Dilldown sandy loam.
16. Germania silt loam.
17. Lackawanna channery loam.
18. Lackawanna channery silt loam.
19. Lackawanna channery silt loam, 25 to 40 inches deep, residual variant.
20. Leetonia stony sandy loam.
21. Leetonia and Dekalb very stony soils.
22. Lordstown channery silt loam, neutral variant.
23. Mardin channery silt loam.
24. Minora silt loam.
25. Mixed alluvium.
26. Morris silt loam.
27. Muck (Peat and Muck, undifferentiated).
28. Nolo stony sandy loam, sandy variant.
29. Red Hook silt loam.
30. Riverwash.
31. Sweden loam.
32. Sweden stony loam.
33. Tioga fine sandy loam.
34. Tioga fine sandy loam, high bottom phase.
35. Tunkhannock flaggy loam.
36. Tunkhannock gravelly loam.
37. Volusia channery silt loam.
38. Volusia flaggy silt loam.
39. Wellsboro channery silt loam.
40. Wharton channery silt loam.
41. Woostern gravelly loam.

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able or very friable, and very strongly acid (pH about 4.5). The A_2 horizon, typical of Podzols, is well developed and leached. The lower subsoil is heavy textured, very firm, and strikingly yellowish red (5YR 5/6 to 4/8). It is much less acid (pH about 5.5) than the surface soil.

According to Denny (*7*), the lower horizons of the Sweden soils are the remnants of ancient soils that developed in pre-Wisconsin age, probably during the Sangamon interglacial stage. During the early Wisconsin age, the upper part of the ancient soils was largely removed by mass movement down slope.

A profile description of Sweden stony loam follows:

A_0 1 to 0 inch, forest layer of loose leaves and twigs underlain by a granular root mor; extremely acid.

A_1 0 to 1 inch, very dark gray when moist (5YR 3/1), very friable, extremely acid, stony loam; weak medium crumb structure.

A_2 1 to 3 inches, light-gray to light brownish-gray when moist (10YR 7/2 to 7/6), very friable fine sandy loam (bleicherde); structureless; very strongly acid.

B_{21} 3 to 4 inches, firm, brittle, very strongly acid, dark reddish-brown (5YR 3/2 to 3/3) fine sandy loam (orterde); fine subangular blocky structure.

B_{22} 4 to 18 inches, very friable, yellowish-brown (10YR 5/6 to 5/8), very strongly acid fine sandy loam; fine subangular blocky structure.

B_{23} 18 to 24 inches, friable, yellowish-brown (10YR 5/6), strongly acid fine sandy loam; weak medium subangular blocky structure.

B_{24b} 24 to 34 inches (Red-Yellow Podzolic relict horizon), yellowish-red (5YR 5/6 to 4/8) strongly acid clay loam; contains about 10 percent olive sandstone; very firm (hard when dry); weak medium subangular blocky structure.

B_{25b} 34 inches to undetermined depth (Red-Yellow Podzolic relict horizon), red (2.5YR 4/6), strongly acid, gravelly clay loam; extremely firm (very hard when dry); strong medium to coarse subangular blocky structure that may be somewhat laminated in places.

Mechanical analysis shows that the relict horizons below 24 inches have 35 to 40 percent clay, but the yellow sandy surface layers have only 15 to 18 percent. Analysis of a soil similar to the one described above is given in table 9.

Studies by Yearick (*17*) show that the clay in the subsoil of the Lackawanna soils is mostly illite. In contrast, the Sweden subsoil from depths of 36 to below 50 inches has very little illite, a small fraction of gibbsite, and a moderate content of kaolinite. At these depths it also has a fairly strong X-ray pattern of vermiculite or chlorite.

These kinds of clay minerals indicate that the yellowish-red subsoil in the Sweden soils formed during some previous warmer period. Some of the pebbles and channers in the subsoil below a depth of 36 inches are yellowish red or have yellowish-red rinds that enclose a greenish-gray interior that is less weathered than the rinds. Some of these pebbles and channers are strongly weathered and soft enough to be cut easily with a spade.

Germania silt loam also occurs on older materials. The Germania soils south of the limit of Wisconsin glaciation occur in the southern part of Potter County. The parent material of the well-drained Germania soils are primarily terrace and colluvial deposits that form sloping benches and fans. These fans resemble Wisconsin glaciofluvial deposits in general appearance, but they lack erratics or other definitive evidence of glacial origin. The deep weathering suggests that these materials are of pre-Wisconsin age. A few of the deposits have clay or silt lenses in the substratum. Several features of the gravelly parent materials of the Germania soils suggest that these materials were disturbed and in many places completely removed during the early Wisconsin age. Among the features indicating disturbance are the fanlike form of the deposits and their close association with and transition into much less weathered frost-worked deposits of Wisconsin age.

Brown Forest Soils

Lordstown channery silt loam, neutral variant, was proposed by the author as a member of a new series (*10*). It is inextensive and occurs as isolated, small areas intermingled with Lordstown and Lackawanna soils and is therefore named a neutral variant. The soil has developed on the fairly narrow, discontinuous, calcareous strata that occur in the noncalcareous bedrock. This neutral variant has many characteristics of Brown Forest soils, as, for example, its uni-

TABLE 7. — *Soil series of Potter County, Pa., classified by great soil groups, and the parent material and drainage for each*

Parent material	Drainage						
	Excessive	Somewhat excessive	Good	Moderately good	Somewhat poor	Poor	Very poor
Glacial till or frost-worked materials, or both, from—							
Gray acid sandstone, siltstone, and shale; deep; firm to very firm:							
Podzol			Bath	Mardin			
Low-Humic Gley						Volusia	
Humic Gley							Chippewa.
Red, brown, and gray acid sandstone, siltstone, and shale; deep; firm to very firm:							
Podzol			Cattaraugus	Culvers			
Low-Humic Gley						Morris	
Humic Gley							Norwich.
Red acid sandstone, siltstone, shale; deep; firm or compact:							
Podzol			Lackawanna	Wellsboro			
Gray shales and siltstones; deep; compact, very sticky and plastic:							
Low-Humic Gley						Brinkerton, Armagh.	
Reddish frost-worked materials; deep; friable to firm:							
Red-Yellow Podzolic			Sweden				
Red and gray acid sandstone and siltstone; shallow to bedrock; friable to firm:							
Podzol			Oquaga				
Glacial till from—							
Gray acid sandstone and shale; deep; loose or friable to firm:							
Podzol			Woostern				
Residuum from—							
Conglomerate and coarse-textured sandstone:							
Podzol	Leetonia	Dekalb (sandy).	Dekalb (loamy).				
Low-Humic Gley						Nolo (Sandy).	
Conglomerate, sandstone, and shale:							
Gray-Brown Podzolic			Clymer	Cookport			
Low-Humic Gley						Nolo	
Red acid shale:							
Podzol			Minora				
Calcareous sandstone or sandy limestone:							
Brown Forest			Lordstown, neutral variant.				
Gray to yellowish-brown clay shale and siltstone:							
Gray-Brown Podzolic				Wharton	Cavode		
Red, medium-textured sandstone:							
Podzol			Dilldown				
Glacial till and residuum from—							
Gray acid sandstone and siltstone; shallow to bedrock; very friable to firm:							
Podzol			Lordstown				
Glaciofluvial material from—							
Yellow or brown acid gravel and sand:							
Podzol		Chenango		Braceville			
Red or reddish-brown acid gravel and sand:							
Podzol			Tunkhannock				
Older materials (probably pre-Wisconsin) on terraces and colluvial deposits from reddish silt, sand, and gravel; friable to firm:							
Red-Yellow Podzolic			Germania				

TABLE 7. — *Soil series of Potter County, Pa., classified by great soil groups, and the parent material and drainage for each*—Continued

Parent material	Drainage						
	Excessive	Somewhat excessive	Good	Moderately good	Somewhat poor	Poor	Very poor
Postglacial alluvium on terraces—							
Yellow or brown silt, sand, and gravel:							
Podzol			Unadilla	Scio			
Low-Humic Gley						Red Hook	
Reddish silt, sand, and gravel:							
Podzol			Vrooman				
Postglacial alluvium on bottom land—							
Yellowish-brown and brown sand and gravel:							
Alluvial			Tioga	Middlebury		Holly	Papakating.
Reddish sand and gravel:							
Alluvial			Barbour	Basher			

TABLE 8. — *Average chemical analyses for some profiles of similar soils of Potter County, Pa.*

[Analyses by Soil Survey Laboratory, SCS, Beltsville, Md.; average values for soil horizons computed by W. H. Lyford]

BATH, CATTARAUGUS, AND LACKAWANNA SOILS (13 PROFILE SAMPLES)

Horizon	Average depth	Milliequivalents per 100 grams of soil						Base saturation	Organic carbon	N	C/N ratio	pH
		Ca	Mg	K	Na	H	Sum					
	Inches							*Percent*	*Percent*	*Percent*		
A_p fertilized	0–7	7.3	0.6	0.1	0.2	13.6	21.8	38	3.49	0.262	14.4	5.1
A_p not fertilized	0–7	1.8	.4	.1	<.1	16.5	18.8	12	2.64	.192	13.9	4.6
B_{22}	7–14	1.2	.2	.1	<.1	13.1	14.5	9	.88	.082	10.6	4.6
B_{23}	14–26	.8	.2	.1	<.1	8.5	9.7	12	.39	.053	8.1	4.7
Cm	26–36+	.7	.3	.1	<.1	7.2	8.4	12	.22	.042	6.9	4.7
CULVERS, MARDIN, AND WELLSBORO SOILS (3 PROFILE SAMPLES)												
A_p probably fertilized	0–8	3.4	.4	.2	.1	19.8	23.4	17	2.75	.257	10.7	4.7
B_{22}	8–20	1.2	.3	.1	<.1	17.1	19.3	9	1.08	.124	8.3	4.7
B_{23gm}	20–36	1.1	.3	.1	<.1	11.2	12.7	14	.25	.055	4.3	4.9
C_{21gm}	36–49	3.2	1.1	.1	.1	9.5	14.0	31	.27	.053	3.3	5.1
C_{22gm}	49+	4.5	2.5	.1	.1	5.2	12.5	58	.05	.038	2.3	5.5

TABLE 9. — *Mechanical analyses and pH of some of the horizons of Sweden stony loam*

Sample No.	Horizon	Depth	pH	Very coarse sand	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay	Other classes	
											0.02—0.002 mm.	2 mm.>
		Inches		*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
51187	B_{22}	10–12	4.5	2.7	2.5	3.4	24.0	11.4	40.9	[1] 15.1	27.1	15
51185	B_{23}	20–24	5.1	2.5	2.5	3.7	23.3	9.7	39.9	[1] 13.4	27.6	36
51188	B_{21b}	24–34	5.5	1.8	1.7	2.1	12.4	10.1	31.1	40.8	20.7	6
51186	B_{22b}	36–40	5.5	1.5	1.4	2.2	16.3	10.3	30.6	[2] 37.7	20.6	9
51189	B_{23b}	50+	5.5	2.2	1.7	2.0	13.2	10.3	32.5	[2] 38.1	22.1	45

[1] Eight percent kaolinite, a trace of gibbsite, and large amounts of illite or other micaceous minerals.

[2] About 20 percent is kaolinite, and 3 to 4 percent is gibbsite, illite-mica, and chlorite or vermiculite (i.e. a mineral with 14A interplane spacing but not montmorillonite).

formly dark-brown or reddish-brown solum and its granular structure throughout the profile. The soil, however, is more strongly acid in the solum than most Brown Forest soils. The largest area of this soil is at the head of Dodge Hollow Run in Harrison Township.

Low-Humic Gley and Humic Gley Soils

Aeration is restricted in the poorly drained Low-Humic Gley and the very poorly drained Humic Gley soils of Potter County. Consequently, iron compounds are reduced in these soils by the action of water in the presence of organic matter. Soils of the Volusia, Nolo, Brinkerton, Armagh, Morris, and Red Hook series are Low-Humic Gleys. They have the mottled yellow and gray subsoils close to the surface that indicate alternate reduction and oxidation. Most of the Chippewa and Norwich soils, which are Humic Gleys, have gray subsoils that indicate practically no aeration. One member of the Nolo series—Nolo stony sandy loam, sandy variant—has a thick gray leached layer very much like the A_2 layer of the zonal Podzol, Leetonia loamy sand. The lower horizons of the Nolo stony sandy loam, sandy variant, however, are mottled yellow and gray, which is indicative of gleization.

The Volusia soils have developed on compact, mottled gray and yellow glacial till that is extremely hard when dry. The percentage of silt and clay in the surface soil and subsoil is high, and the soil cannot be plowed easily except at the proper moisture conditions. This gleyed soil is the least acid in the lower subsoil.

Following is a profile description of Volusia channery silt loam:

A_p 0 to 7 inches, dark-gray (10YR 4/1), very strongly acid, friable channery silt loam; strong medium granular structure.

A_2 7 to 12 inches, grayish-brown (10YR 5/2), strongly acid, firm channery silt loam; strong medium platy structure.

B_{21gm} 12 to 18 inches, mottled yellow and gray, strongly acid channery silty clay loam; plastic and sticky when wet, very hard and blocky when dry; strong thick platy structure.

B_{22gm} 18 to 40 inches, channery clay or clay loam; strongly mottled gray and yellow, with some brown; strongly acid to medium acid; hard and compact; strong coarse subangular blocky structure.

B_{23gm} 40 inches to undetermined depth, mottled and streaked gray, brown, and yellow channery clay loam or silty clay loam; medium acid; strong coarse subangular blocky structure; very plastic and sticky when wet, extremely hard when dry; layer grades at 6 or 7 feet into clay till material that is only slightly acid.

Most of the profiles of Volusia channery silt loam are remarkably uniform. The greatest variation occurs in the A_2 layer. In places this layer is yellowish brown and slightly mottled. In these places it is more friable than normal and the soil is somewhat poorly rather than poorly drained.

The Chippewa and Norwich soils are very poorly drained. The Chippewa soils are from gray and yellow materials, and the Norwich soils from brownish or reddish-gray materials.

Profile description of Norwich silt loam.

A_0 2 to 0 inches, dark-brown, or black, extremely acid, mucklike silt loam; water often stands in pockets.

A_1 0 to 7 inches, dark grayish-brown very strongly acid silt loam that is stained in places with organic matter; weak medium granular structure.

B_{21g} 7 to 14 inches, pale-brown, slightly mottled with gray, very strongly acid silt loam; firm; structureless.

B_{22g} 14 to 20 inches, mottled red, brown, yellow, and gray strongly acid silty clay loam or clay loam; very firm or compact; more or less saturated.

G 20 inches +, mottled gray, very plastic or hard material that rests on compact flaggy or stony till, or till-like deposits; strongly acid.

Alluvial Soils

Alluvial soils occur on the bottom lands. They are generally without definite profile development. These soils are normally underlain by gravel, but drainage ranges from somewhat excessive to very poor. Stratification is pronounced, but the sorting of the sands, silts, and gravel in most of these soils is limited. A few of the gravelly types of soil are coarse throughout the profile, but most have finer sediments and are generally silt, fine sand, and sandy loam.

Organic Soils

A very small acreage of the Organic soils, Peat and muck, undifferentiated, also occurs in Potter County. The largest single area is located near the county line north of Eleven Mile. The muck is strongly acid and is generally saturated throughout the year at depths of 2 to 3 feet. The lower part of the deposit, to a depth of about 5 feet, is finely fibrous peat, which rests on gray and yellow clay loam.

Soil Survey Methods

Soil surveying consists of the examination, classification, and mapping of soils in the field. The soil scientist walks over the area and makes borings, digs test holes, and examines highway and railway cuts. From his observations, he sees that the soil consists of several distinctly different layers, called horizons. Collectively these soil horizons are known as the soil profile (*11*). Each of these layers is studied carefully for the things about it that affect plant growth.

The color of each layer is noted. The darkness of the topmost layer is usually related to the content of organic matter; streaks and spots of gray, yellow, and brown in lower layers generally indicate poor drainage and poor aeration.

The texture, or content of sand, silt, and clay, of each layer, is determined by the feel of the soil. It is checked by mechanical analyses in the laboratory. Texture has much to do with the quantity of moisture the soil holds available to plants. In addition, it affects the amount of plant nutrients or fertilizer that is held available or leached out. The ease or difficulty with which a soil is cultivated depends largely on texture.

Structure affects the way a soil granulates. It is determined by the arrangement of soil particles and aggregates and by the pore space between particles.

The ease with which plant roots penetrate the soil and water enters it depend on structure (*11*).

The tendency of a soil to crumble or stick together determines consistence. Consistence affects the ease of keeping the soil open and porous during cultivation.

The kind of rock from which a soil developed, or its parent material, affects the quantity and kind of natural plant nutrients in the soil. Simple tests determine acidity. The depth to bedrock is observed. The quantity of gravel or rocks that may interfere with cultivation, the steepness of slope, signs of erosion, and other external features are noted.

On the basis of these characteristics, soils that are much alike in kind, thickness, and arrangement of layers are classified as one soil type. Soil types may be separated into two or more phases. For example, Cattaraugus stony loam has slopes between 0 and 30 percent. This type is divided, on the basis of slope, into two phases: Cattaraugus stony loam, 0 to 20 percent slopes, and Cattaraugus stony loam, 20 to 30 percent slopes.

A soil type is divided into phases primarily because of differences in the soil other than those of kind, thickness, and arrangement of layers. The slope of a soil, the frequency of outcropping bedrock, or the extent of erosion are examples of characteristics that might be the basis for dividing a soil type into phases.

Two or more soil types may have similar profiles. The soil layers may be nearly the same, except that the texture, especially the texture of the surface layer, is different. If the other characteristics of the soil layers are similar, these soils are placed in the same soil series. A soil series therefore consists of all the soil types that, except for texture—particularly texture of the surface layer—have about the same kind, thickness, and arrangement of layers, whether the number of such soil types be only one or several. The name of a place near where a soil series was first found is chosen as the name of the series.

When very small areas of two or more kinds of soils are so intricately mixed that they cannot be shown separately on a map of the scale used, they are mapped together, and the areas of the mixture are called a complex. In Potter County, Scio fine sandy loam-silt loam, 0 to 3 percent slopes, is a complex that consists of Scio fine sandy loam, 0 to 3 percent slopes, and Scio silt loam, 0 to 3 percent slopes.

Areas that have little true soil are not designated by series and type names. They are considered land types and are given descriptive names. Riverwash, 0 to 3 percent slopes, is a land type in Potter County.

The soil phase, or the soil type if it has not been subdivided, is the unit of mapping in soil surveys. It is the unit, or kind, of soil that is most nearly uniform. It has the narrowest range of characteristics. For this reason use and management practices can be more definitely specified for the phase than for broader groups of soils that contain a wider range of characteristics. For example, one can be more specific in suggesting management for Lackawanna channery loam, 0 to 12 percent slopes, than for the many soils of the Lackawanna series or for the many phases of Lackawanna channery loam.

For a definition of some of the terms commonly used in soil surveying, see the glossary at the back of this report.

Engineering Applications[10]

This soil survey report for Potter County, Pennsylvania, contains information which can be used by engineers to:

(1) Make soil and land-use studies that will aid in the selection and development of industrial, business, residential, and recreational sites.
(2) Make estimates of runoff and erosion characteristics, for use in designing drainage structures and planning dams and other structures for water and soil conservation.
(3) Make reconnaissance surveys of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed soil surveys for the intended locations.
(4) Locate sand and gravel for use in structures.
(5) Correlate pavement performance with types of soil and thus develop information that will be useful in designing and maintaining the pavements.
(6) Determine the suitability of soil units for cross-county movements of vehicles and construction equipment.
(7) Supplement information obtained from other published maps and reports and aerial photographs, for the purpose of making soil maps and reports that can be readily used by engineers.

The mapping and the descriptive report are somewhat generalized, however, and should be used only in planning more detailed field surveys to determine the in-place condition of the soil at the site of the proposed engineering construction.

Soil Science Terminology

Some of the terms used by the agricultural soil scientist may be unfamiliar to the engineer, and some words —for example, soil, clay, silt, sand, aggregate, and granular—may have special meanings in soil science. Most of these terms, as well as other special terms used in the soil survey report, are defined in the glossary. Aggregate and granular structure are not defined in the glossary, although they are referred to in the definition of soil structure. They are defined as follows:

Aggregate: A cluster of primary soil particles held together by internal forces to form a clod or fragment.
Granular structure: Individual grains grouped into spherical aggregates with indistinct sides. Highly porous granules are commonly called crumbs.

[10] This section was prepared by the Division of Physical Research, Bureau of Public Roads. Test data in table 10 were obtained in the Soils Laboratory, Bureau of Public Road.

TABLE 10. — *Engineering test data*[1] *for soil samples*

Soil name and location	Parent material	Bureau of Public Roads report number	Depth	Horizon	Moisture-density		Estimated percentage discarded [2]		Mechanical analysis [3]		
									Percentage passing sieve		
					Maximum dry density	Optimum moisture	Larger than 3 inches	3 in.-1 in.	2-in.	1½-in.	1-in.
			Inches		*Lb. per cu. ft.*	*Percent*					
Cattaraugus channery loam:											
1.5 miles S. of Ulysses, on road to Brookland.	Glacial till	90361	3–5	A_p	98	22	10–20	10		100	95
		90362	3–16	B_1	102	20	20–30	15			100
0.25 mile W. of Brookland, on road to Coudersport.	Glacial till	90363	70–80	C_1	129	10	40–50	20		100	92
Cavode silt loam:											
7 miles E. of Coudersport on U. S. Highway 6, on top of Denton Hill.	Shale (Pocono formation).	90367	0–3	A_1	84	29	0–5	10			100
		90368	6–10	B_1	108	19	0–5	10			
		90369	20–30	C_2	118	14	5–10	20		100	95
Culvers channery silt loam:											
At E. edge of Coudersport along U. S. Highway 6.	Glacial till	90372	8–20	B_1	118	13	30–40	10	100	96	94
		90373	38–52	C_{1g}	129	9	40–50	10		100	96
		90374	70–80	C_1	126	11	60–70	10	100	97	90
Lackawanna channery silt loam:											
3 miles S. of Brookland, on State Highway 449.	Glacial till	90364	6–16	B_1	107	19	20–30	10	100	89	88
		90365	20–30	C_1	123	12	40–50	20	100	93	83
		90366	40–50	C_2	122	13	50–60	20		100	98
Leetonia stony loamy sand:											
3 miles N. of Keating Summit; top of plateau, on road to Card Creek.	Coarse sandstones and conglomerate (Pocono and Pottaville formation).	90370	5–10	A_2	121	10	80	10			100
		90371	15–25	B_2	117	12	70	10	100	95	91
Volusia channery silt loam:											
0.25 mile NW. of Mills	Glacial till	90378	3–10	A_p	89	28	10–20	10–20		100	94
		90379	20–30	C_{1g}	111	17	20–30	20–30			100
Woostern gravelly loam:											
In roadcut just E. of Gold, on road to Ulysses (State Highway 49).	Kame	90375	10–20	B_2	105	19	10–20	10–20	100	77	77
		90376	40–50	C_2	124	10	30–40	10–20	100	94	90
		90377	90–100	C_4	106	16					

[1] Tests performed by Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway Officials (A.A.S.H.O.) (*1*).

[2] These estimated percentages represent the normal range for the soil series mapped in Potter County and may not represent the sampling site.

[3] Mechanical analyses are based on the soil samples as received by the Bureau of Public Roads Laboratory and tested according to the American Association of State Highway Officials Designation: T 88-54. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the A.A.S.H.O. procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material in the soil sample, including that coarser than 2 mm. in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette

taken from eight soil profiles, Potter County, Pa.

Mechanical analysis [3]—continued											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued							Percentage smaller than							
¾-in.	⅜-in.	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 60 (0.25 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			A.A.S.H.O.[4]	Unified [5]
95	93	91	89	85	83	63	56	41	22	14	40	10	A-4(6)	ML
97	92	90	89	85	84	66	61	47	28	19	35	10	A-4(6)	ML-CL
88	72	60	52	43	41	31	27	19	10	6	21	5	A-2-4(0)	GM-GC
99	99	98	96	89	86	82	80	71	40	24	56	13	A-7-5(12)	MH or OH
100	99	96	90	83	81	76	75	70	43	25	36	11	A-6(8)	ML-CL
88	79	68	57	51	50	48	47	42	26	15	34	12	A-6(3)	GC
87	78	71	66	57	53	40	36	27	13	9	25	6	A-4(1)	SM-SC
91	83	76	69	56	52	35	30	19	9	6	19	3	A-2-4(0)	SM
84	71	64	59	52	50	39	32	21	10	7	22	6	A-4(1)	GM-GC
87	79	75	71	67	65	50	43	32	18	13	32	9	A-4(3)	GC
76	63	54	47	40	38	28	24	17	10	6	23	5	A-2-4(0)	GM-GC
97	89	80	70	64	62	54	52	45	30	19	29	11	A-6(4)	CL
97	92	88	85	72	51	29	25	18	8	5	NP [6]	NP [6]	A-2-4(0)	SM
86	79	73	69	55	44	28	25	19	8	6	NP [6]	NP [6]	A-2-4(0)	SM
93	90	89	88	86	84	77	75	66	48	38	57	20	A-7-5(15)	MH
99	97	96	95	93	92	84	81	69	47	38	42	20	A-7-6(12)	CL
74	64	58	54	46	44	32	29	21	11	6	31	3	A-2-4(0)	GM
77	56	45	38	29	26	14	13	8	4	2	NP [6]	NP [6]	A-1-a(0)	GM
			100	99	96	11	9	5	4	3	NP [6]	NP [6]	A-2-4(0)	SP-SM

method and the material coarser than 2 mm. in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming texture classes for soils.

[4] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing, pt. 1, ed. 7(*1*). The Classification of Soils and Soil-Aggregate Mixtures for Highway Purposes, A.A.S.H.O. Designation: M 145-49. The percentage discarded in field sampling has not been used in these classifications.

[5] Based on the Unified Soil Classification System. Tech. Memo. 3-357, v. 1, Waterways Experiment Station, Corps of Engineers, March 1953 (*16*). The percentage discarded in field sampling has not been used in these classifications.

[6] NP—nonplastic.

Soil Test Data and Engineering Soil Classifications

To be able to make the best use of the soil maps and the soil survey reports, the engineer should know the physical properties of the soil materials and the in-place condition of the soil. After testing soil materials and observing the behavior of soils when used in engineering structures and foundations, the engineer can develop design recommendations for the soil units delineated on the maps.

Soil Test Data

Soil samples from the principal soil type of each of seven extensive soil series were tested in accordance with standard procedures (*1*) to help evaluate the soils for engineering purposes. The test data are given in table 10. The mechanical analyses were made on samples from which the very coarse fragments were discarded during sampling; the grain size distributions shown in the table are not corrected for the percentages discarded. Table 10 also gives estimated percentages discarded for each of two size fractions of coarse fragments.

The engineering soil classifications in table 10 are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. Mechanical analyses were made by combined sieve and hydrometer methods. Percentage of clay obtained by the hydrometer method should not be used in naming soil texture classes.

The liquid limit and plastic limit tests measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a solid to semisolid or plastic state. As the moisture content is further increased, the material changes from the plastic to a liquid state. The plastic limit is the moisture content at which the soil material passed from a solid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Table 10 also gives compaction (moisture-density) data for the tested soils. If a soil material is compacted at successively higher moisture contents, assuming that the compactive effort remains constant, the density of the compacted material will increase until the "optimum moisture content" is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork, for as a rule optimum stability is obtained if the soil is compacted to about the maximum dry density, when it is at approximately the optimum moisture content.

Engineering Classification Systems

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (*1*). In this system, soil materials are classified in seven principal groups. The groups range from A–1, consisting of gravelly soils of high bearing capacity, to A–7, consisting of clay soils having low strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best materials to 20 for the poorest. The group index number is shown in parentheses, following the soil group symbol, in the next to last column of table 10. The principal characteristics according to which soils are classified in this system are shown in table 11.

Some engineers prefer to use the Unified soil classification system (*16*). In this system, soil materials are identified as coarse-grained (8 classes), fine-grained (6 classes), or highly organic. The principal characteristics of the 15 classes of soil are given in table 12. The classification of the tested soils according to the Unified system is given in the last column of table 10.

The soil classes given in the last two columns of table 10 are based on the data obtained by testing the samples submitted to the laboratory. Some of the soil materials will be in another class if the percentage discarded in field sampling is considered.

Soil Engineering Data and Recommendations

Some of the engineering information can be obtained from the soil map. It will often be necessary, however, to refer to other sections of the report, particularly these sections: The Soils of Potter County, General Nature of the Area, and Morphology and Genesis.

The highway soil engineering data and recommendations given in table 13 were made on the basis of the soil test data in table 10, information in the rest of the report, and experience with the same kind of soils in other counties. Some of the soil series that have minor extent and no specific engineering importance are not listed.

The range of texture (grain size) of some of the materials is considerable, therefore the engineering soil classification of table 13 may not apply to all parts of a mapped soil unit. Also, in establishing the engineering soil classification, the particles larger than 3 inches in size are not considered.

Large rock fragments are contained in many of the soils derived from glacial till and glaciofluvial deposits or that developed through weathering of bedrock. These large fragments are important in earthwork because the in-place body of material may be difficult to excavate with some types of equipment. Furthermore, the large fragments may prevent the use of tamping rollers on the material if it is placed in embankments. The large fragments must be crushed or removed to make the material suitable for use in foundation or base courses for pavements of roads that will carry a high to moderate volume of traffic with heavy axle loads. The fragments must also be crushed or removed if the material is used as a pavement for county roads that are to carry only slight traffic.

TABLE 11. — *Classification of soils by American Association of State Highway Officials*

General classification	Granular materials (35 percent or less passing No. 200 sieve)							Silt-clay ma (More than 35 percent pa		
Group classification	A-1		A-3	A-2				A-4	A-5	A-6
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7			
Sieve analysis:										
Percent passing—										
No. 10	50 maximum									
No. 40	30 maximum	50 maximum	51 minimum							
No. 200	15 maximum	25 maximum	10 maximum	35 maximum	35 maximum	35 maximum	35 maximum	36 minimum	36 minimum	36 minim
Characteristics of fraction passing No. 40 sieve.										
Liquid limit			NP[2]	40 maximum	41 minimum	40 maximum	41 minimum	40 maximum	41 minimum	40 maxim
Plasticity index	6 maximum	6 maximum	NP[2]	10 maximum	10 maximum	11 minimum	11 minimum	10 maximum	10 maximum	11 minim
Group index	0	0	0	0	0	4 maximum	4 maximum	8 maximum	12 maximum	16 maxim
Usual types of significant constituent materials.	Stone fragments, gravel, and sand.	Stone fragments, gravel, and sand.	Fine sand.	Silty gravel and sand.	Silty gravel and sand.	Clayey gravel and sand.	Clayey gravel and sand.	Nonplastic to moderately plastic silty soils.	Highly elastic silts.	Medium plastic clays.
General rating as subgrade.	Excellent to good					Fair to poor				

[1] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (pt. 1; ed. 7): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, A.A.S.H.O. Designation: M 145–49 (*1*).

[2] NP—nonplastic.

[3] Plasticity index of A–7–5 subgroup is equal to or less ity index of A–7–6 subgroup is greater than LL minus

TABLE 12. — *Characteristics of soil groups in Unified soil classification system*[1]

Major divisions	Group symbol	Soil description	Value as foundation material [2]	Value as base course directly under bituminous pavement	Value for embankments	Compaction: Characteristics and recommended equipment	Approximate range in A.A.S.H.O. maximum dry density [3]	Field (in-place) CBR	Subgr modu k
							Lb./cu. ft.		*Lb./ in./*
Coarse-grained soils (*less than 50 percent passing No. 200 sieve*):									
Gravels and gravelly soils (*more than half of coarse fraction retained on No. 4 sieve.*)	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	Excellent	Good	Very stable; use in pervious shells of dikes and dams.	Good; use crawler-type tractor, pneumatic-tire roller, or steel-wheel roller.	125–135	60–80	3
	GP	Poorly graded gravels and gravel-sand mixtures; little or no fines.	Good to excellent.	Poor to fair	Reasonably stable; use in pervious shells of dikes and dams.	Same	115–125	25–60	3
	GM	Silty gravels and gravel-sand-silt mixtures.	Good	Poor to good	Reasonably stable; not particularly suited to shells, but may be used for impervious cores or blankets.	Good, but needs close control of moisture; use pneumatic-tire or sheepsfoot roller.	120–135	20–80	200–3
	GC	Clayey gravels and gravel-sand-clay mixtures.	Good	Poor	Fairly stable; may be used for impervious core.	Fair, use pneumatic-tire or sheepsfoot roller.	115–130	20–40	200–3
Sands and sandy soils (*more than half of coarse fraction passing No. 4 Sieve*).	SW	Well-graded sands and gravelly sands; little or no fines.	Good	Poor	Very stable; may be used in pervious sections; slope protection required.	Good; use crawler-type tractor or pneumatic-tire roller.	110–130	20–40	200–3
	SP	Poorly graded sands and gravelly sands; little or no fines.	Fair to good	Poor to not suitable.	Reasonably stable; may be used in dike section having flat slopes.	Same	100–120	10–25	200–3
	SM	Silty sands and sand-silt mixtures.	Fair to good	Same	Fairly stable; not particularly suited to shells, but may be used for impervious cores or dikes.	Good, but needs close control of moisture; use pneumatic-tire or sheepsfoot roller.	110–125	10–40	200–3
	SC	Clayey sands and sand-clay mixtures.	Fair to good	Not suitable	Fairly stable; use as impervious core for flood-control structures.	Fair; use pneumatic-tire roller or sheepsfoot roller.	105–125	10–20	200–3

Major divisions	Group symbol	Soil description	Value as foundation material [2]	Value as base course directly under bituminous pavement	Value for embankments	Compaction: Characteristics and recommended equipment	Approximate range in A.A.S.H.O. maximum dry density [3]	Field (in-place) CBR	Subgr modu k
							Lb./cu. ft.		*Lb./ in./*
Fine-grained soils (*more than 50 percent passing No. 200 sieve*):									
	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, and clayey silts of slight plasticity.	Fair to poor	Not suitable	Poor stability; may be used for embankments if properly controlled.	Good to poor; close control of moisture is essential; use pneumatic-tire or sheepsfoot roller.	95–120	5–15	100–2
Silts and clays (*liquid limit of 50 or less*).	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays.	Fair to poor	Not suitable	Stable; use in impervious cores and blankets.	Fair to good; use pneumatic-tire or sheepsfoot roller.	95–120	5–15	100–2
	OL	Organic silts and organic clays having low plasticity.	Poor	Not suitable	Not suitable for embankments.	Fair to poor; use sheepsfoot roller. [4]	80–100	4–8	100–2
	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, and elastic silts.	Poor	Not suitable	Poor stability; use in core of hydraulic fill dam; not desirable in rolled fill construction.	Poor to very poor; use sheepsfoot roller. [4]	70–95	4–8	100–2
Silts and clays (*liquid limit greater than 50*).	CH	Inorganic clays having high plasticity and fat clays.	Poor to very poor.	Not suitable	Fair stability on flat slopes; use in thin cores, blankets, and dike sections of dams.	Fair to poor; use sheepsfoot roller. [4]	75–105	3–5	50–1
	OH	Organic clays having medium to high plasticity and organic silts.	Same	Not suitable	Not suitable for embankments.	Poor to very poor; use sheepsfoot roller. [4]	65–100	3–5	50–1
Highly organic soils:	Pt	Peat and other highly organic soils.	Not suitable	Not suitable	Not used in embankments, dams, or subgrades for pavements				

[1] Based on information in The Unified Soil Classification System, Technical Memorandum No. 3–357. Volumes 1, 2, and 3, Waterways Experiment Station, Corps of Engineers, 1953. Ratings and ranges in test values are for guidance only. Design should be based on field survey and test of samples from construction site.

[2] Ratings are for subgrade and subbases for flexibl

[3] Determined in accordance with test designation:

[4] Pneumatic-tire rollers may be advisable, particu is higher than optimum.

TABLE 13.— *Highway soil engineering data and recommendations*

RESIDUAL

Soil series or soil type	Brief description of soil profile and ground condition	Dominant slope	Estimated soil classification		Adaptability to winter grading	Depth to seasonally high water table [1]	Recommended location of gradeline with respect to ground surface	Suitability as	
			A.A.S.H.O.	Unified				Topsoil [2]	
		Percent				*Feet*			
Cavode	½ to 4 feet of somewhat poorly drained shaly silty clay loam to silty clay derived from shale and siltstone.	0–15	A–6 or A–7	CL, CH, or MH.	Not adapted.	Water at ground surface.	Location influenced by bedrock.	Fair to poor.	N
Clymer channery loam.	2 to 6 feet of well-drained channery loam and sandy loam derived from sandstone and siltstone.	0–30	A–2, A–4, or A–6.	GM, SM, SC, ML, or CL.	Fair	Deep	Same	Fair [4]	I
Clymer stony loam.	2 to 6 feet of well-drained stony or flaggy loam and sandy loam derived from sandstone and siltstone.	0–30	A–2, A–4, or A–6.	SM, SC, ML, or CL.	Fair	Deep	Same	Poor [4]	I
Cookport	2 to 6 feet of moderately well-drained sandy loam to sandy clay derived from sandstone and siltstone.	0–25	A–2, A–4, or A–6.	SC, SM, ML, or CL.	Limited	1½—2½ (perched).	Same	Fair to good	I
Dekalb channery loam, 10 to 25 inches deep.	1 to 2 feet of well-drained channery loam derived from sandstone and shale.	0–30	A–2, A–4, or A–6.	GM, GC, ML, or CL.	Fair	Deep	Same	Fair to poor. [4]	I
Dekalb channery loam, 40 or more inches deep.	2 to 5 feet of well-drained channery loam and channery sandy loam derived from sandstone and siltstone.	0–40	A–2, A–4, or A–6.	GM, SM, SC, ML, or CL.	Fair	Deep	Same	Fair to poor. [4]	I
Dekalb fine sandy loam.	2 to 7 feet of well-drained sandy loam derived from sandstone.	0–30	A–2 or A–4	SM or SC	Fair	Deep	Same	Fair	I
Dekalb stony loam, 10 to 25 inches deep.	0 to 2 feet of well-drained stony loam and stony sandy loam derived from sandstone.	0–30	A–2 or A–4	SM, SC, ML, or CL.	Fair	Deep	Same	Poor [4]	I
DeKalb stony loam, 40 or more inches deep.	2 to 5 feet of well-drained stony loam and stony sandy loam derived from sandstone.	0–30	A–2, A–4, or A–6.	SM, SC, ML, or CL.	Fair	Deep	Same	Poor [4]	I
Leetonia stony loamy sand.	1½ to 2½ feet of well-drained stony sand or stony loamy sand derived from sandstone.	0–30	A–2 or A–3	SM or SP	Fair	Deep	Same	Not suitable. [4]	N
Leetonia channery loamy sand and Dekalb channery loam.	½ to 1½ feet of well-drained channery loamy sand and channery loam; outcrops of sandstone and siltstone common.	30–60	A–2, A–3, A–4.	GM, SP, SM, SC, or ML.	Fair	Deep	Same	Not suitable. [4]	N

See footnotes at end of table.

Soil series or soil type	Brief description of soil profile and ground condition	Dominant slope	Estimated soil classification		Adaptability to winter grading	Depth to seasonally high water table [1]	Recommended location of grade line with respect to ground surface	Suitability as	
			A.A.S.H.O.	Unified				Topsoil [2]	
		Percent				*Feet*			
Leetonia and Dekalb very stony soils.	About 2 feet of well-drained very stony sandy soil derived from conglomerate and sandstone; many boulders may cover ground locally.	30–70	A–2 or A–4	SP, SM, or ML.	Fair	Deep	Same	Not suitable. [4]	
Wharton	2 to 6 feet of moderately well drained loam to shaly clay derived from sandstone, shale, and siltstone.	0–30	A–4, A–6, or A–7.	CL, CH, ML, or MH.	Not adapted.	About 2 (perched).	Same	Fair	
				GLACIAL TILL					
Bath	3 to 10 feet of well-drained channery silt loam over bedrock.	0–40	A–2, A–4, or A–6.	GM, GC, ML, or CL.	Not adapted.	Deep	Location influenced by bedrock.	Fair to good. [4]	
Cattaraugus channery loam.	4 to 20 feet of well-drained channery loam over bedrock.	0–40	A–2, A–4, or A–6.	GM, ML, or CL.	Not adapted.	Deep	Same	Fair to good. [4]	
Cattaraugus stony loam.	4 to 20 feet of stony or flaggy loam and stony or flaggy sandy loam over bedrock; stones and boulders up to 3 feet in diameter on surface.	0–30	A–2, A–4, or A–6.	SM, ML, or CL.	Limited	Deep	Same	Not suitable. [4]	
Cattaraugus and Lackawanna channery loams.	4 to 20 feet of well drained channery loam over bedrock.	40–60	A–2, A–4, or A–6.	GM, GC, ML, or CL.	Not adapted.	Deep	Same	Fair to good. [4]	
Cattaraugus and Lackawanna stony loams.	4 to 20 feet of well-drained stony or flaggy loam over bedrock.	30–60	A–4 or A–6	ML or CL	Not adapted.	Deep	Same	Not suitable. [4]	
Culvers channery silt loam.	4 to 20 feet of moderately well drained channery silt loam, channery sandy clay loam, and channery clay loam over bedrock; hardpan at depth ranging from about 1½ to 6 feet.	0–35	A–2, A–4, or A–6.	GM, SM, SC, ML, or CL.	Not adapted.	1½–2½ (perched).	Same	Poor [4]	
Culvers stony silt loam.	4 to 20 feet of moderately well-drained stony or flaggy silt loam to stony or flaggy clay loam; hardpan at depth ranging from about 1½ to 6 feet.	0–35	A–4 or A–6	ML or CL	Not adapted.	1½–2½ (perched).	Same	Not suitable. [4]	
Lackawanna	About 6 feet of well-drained channery silt loam over bedrock.	0–40	A–2, A–4, or A–6.	GM, GC, ML, or CL.	Not adapted.	Deep	Same	Fair to good. [4]	

See footnotes at end of table.

TABLE 13.— *Highway soil engineering data and recommendations*—Continued

Soil series or soil type	Brief description of soil profile and ground condition	Dominant slope	Estimated soil classification		Adaptability to winter grading	Depth to seasonally high water table [1]	Recommended location of grade line with respect to ground surface	Suitability as	
			A.A.S.H.O.	Unified				Topsoil [2]	s m
		Percent				*Feet*			
Lackawanna, 25 to 40 inches deep.	2 to 3½ feet of well-drained channery silt loam to channery silty clay loam over bedrock.	0–30	A–2, A–4, or A–6.	GM, GC, ML, or CL.	Not adapted.	Deep	Same	Fair to good. [4]	
Lordstown channery silt loam.	About 2 feet of well-drained channery loam and channery silt loam over bedrock.	3–40	A–2, A–4, or A–6.	GM, GC, CL, or ML.	Fair	Deep	Same	Poor [4]	
Lordstown and Bath channery silt loams.	1 to 4 feet of well-drained channery silt loam and channery loam.	40–60	A–2, A–4, or A–6.	GM, ML, or CL.	Fair	Deep	Same	Poor [4]	
Mardin	4 to 5 feet of moderately well drained channery silt loam and channery clay loam; hardpan 2 to 3 feet thick at a depth of 2 to 2½ feet.	0–35	A–2, A–4, or A–6.	GM, GC, ML, or CL.	Not adapted.	About 2 (perched).	Same	Poor [4]	
Morris silt loam	4 to 20 feet of poorly drained loam to sandy clay over bedrock; thick hardpan at depth of about 2½ feet.	0–25	A–4 or A–6	ML or CL	Not adapted.	½–1 (perched).	Same	Poor	
Morris stony silt loam.	4 to 20 feet of poorly drained stony silt loam and clay loam over bedrock. Thick hardpan at a depth of about 2½ feet.	0–25	A–4 or A–6	ML or CL	Not adapted.	½–1 (perched).	Same	Poor [4]	
Oquaga channery loam.	About 1 to 3 feet of well-drained channery loam over bedrock.	0–50	A–2, A–4, or A–6.	GM, ML, or CL.	Fair	Deep	Same	Poor [4]	
Volusia channery silt loam.	5 to 15 feet of poorly drained channery silt loam to channery silty clay loam over bedrock; plastic layer at depth of 1 to 1½ feet.	3–15	A–4, A–6, or A–7.	ML, CL, or MH.	Not adapted.	½–1 (perched).	Same	Fair	
Volusia flaggy silt silt loam.	4 to 12 feet of poorly drained flaggy loam to flaggy clay loam over bedrock. Flagstones on surface.	0–25	A–4, A–6, or A–7.	ML, CL, or MH.	Not adapted.	½–1 (perched).	Same	Poor [4]	

See footnotes at end of table.

Soil series or soil type	Brief description of soil profile and ground condition	Dominant slope	Estimated soil classification		Adaptability to winter grading	Depth to seasonally high water table [1]	Recommended location of gradeline with respect to ground surface	Suitability as	
			A.A.S.H.O.	Unified				Topsoil [2]	s m
		Percent				*Percent*			
Wellsboro	4 to 20 feet of moderately well drained silt loam to sandy clay loam over bedrock; variable amounts of rock fragments.	0–25	A–4 or A–6	ML or CL	Not adapted.	About 2 (perched).	Same	Fair to good [4].	
Woostern	6 to 20 feet of well-drained gravelly loam and loamy sand with some boulders over bedrock.	0–50	A–1, A–2, A–4, or A–6.	SM, SP, GW, GM, or GP.	Fair	Deep	Same	Fair to good [4].	
				BOTTOM LAND					
Barbour	2 to 4 feet of moderately well drained sandy loam or gravelly sandy loam over 1 to 3 feet of stratified sand and gravel; depth to bedrock, hard clay, or till 3 to 5 feet.	0–3	A–2 or A–4 over A–1, A–2, or A–3.	GM or SM over GP, GM, SP, or SM.	Not adapted.	0–4	2 to 4 feet above high water.	Good	
Basher	1½ to 2½ feet of somewhat poorly drained sandy loam to silty clay loam over stratified sand and gravel; depth to bedrock, hard clay, or till 3 to 5 feet.	0–3	A–2, A–4, or A–6 over A–1, A–2, or A–3.	SM, ML, or CL over GP, GM, SP, or SM.	Not adapted.	0–2	2 to 4 feet above high water.	Good	
Holly	About 2 feet of poorly drained sandy loam over about 2 feet of stratified sand and gravel; or about 2 feet of silt loam over mixed alluvium; depth to bedrock ranges from 3 to 8 feet.	0–3	A–4 over A–2, A–4, or A–6.	SM or ML over GC, GM, SC, ML, or CL.	Not adapted.	About ½	2 to 4 feet above high water.	Good	
Middlebury	2 to 3 feet of moderately well drained sandy loam over about 2 feet of gravelly sandy clay, sand, and gravel; or about 2 feet of silt loam over mixed alluvium.	0–3	A–2 or A–4 over A–1, A–2, A–4, or A–6.	SM or ML over GC, GM, SC, SM, ML, or CL.	Not adapted.	0–2	2 to 4 feet above high water.	Good	

See footnotes at end of table.

TABLE 13.— *Highway soil engineering data and recommendations*—Continued

Soil series or soil type	Brief description of soil profile and ground condition	Dominant slope	Estimated soil classification		Adaptability to winter grading	Depth to seasonally high water table [1]	Recommended location of grade line with respect to ground surface	Suitability as	
			A.A.S.H.O.	Unified				Topsoil [2]	s n
Tioga	About 2 feet of well-drained sandy or gravelly loam and loamy sand over stratified sand and gravel; depth to bedrock is 3 to 10 feet.	*Percent* 0–3	A–2 or A–4 over A–1, A–2, or A–3.	SM, SC, or GM over GP, GM SP, or SM.	Not adapted.	*Feet* 0–4	2 to 4 feet above high water.	Good	
TERRACE AND GLACIOFLUVIAL DEPOSITS									
Braceville	About 2 feet of moderately well drained gravelly silt loam or gravelly loam over stratified sand and gravel; depth to bedrock 4 to 15 feet.	0–5	A–2 or A–4 over A–1, A 2, or A–3.	GM, SM, or ML over GP, GM, SP, or SM.	Fair	2–4	4 feet minimum above water table.	Good	
Chenango	2 to 3 feet of somewhat excessively drained gravelly loam over stratified sand and gravel; depth to bedrock is 5 to 30 feet; cobbles occur locally.	0–50	A–2 or A–4 over A–1, A–2, or A–3.	GM or SM over GP, GM, SP, or SM.	Good	Deep	Influenced by great depth to bedrock.	Good	
Germania	2 to 3 feet of well-drained silt loam to gravelly loam over 3 to 6 feet of clay loam, which is underlain locally by gravel and cobbles; depth to bedrock ranges from 5 to 30 feet.	0–50	A–2 or A–4 over A–4 or A–6.	ML over CL	Limited	Deep	Influenced by great depth to bedrock.	Good	
Red Hook	1½ to 2½ feet of poorly drained silt loam or silty clay loam over stratified sand and gravel. Depth to bedrock ranges from 5 to 30 feet.	0–3	A–4 or A–6 over A–1, A–2, or A–3.	ML or CL over GP, GM, SP, or SM.	Not adapted.	Water at ground surface.	4 feet minimum above water level.	Good	
Scio	1½ to 3 feet of moderately well-drained sandy loam to clay loam over stratified sand and gravel. Depth to bedrock ranges from 5 to 30 feet.	0–3	A–2, A–4, or A–6 over A–1, A–2, or A–3.	ML or CL over GP, GM, SP, or SM.	Fair	1–3	4 feet minimum above water table.	Good	

See footnotes at end of table.

Soil series or soil type	Brief description of soil profile and ground condition	Dominant slope	Estimated soil classification		Adaptability to winter grading	Depth to seasonally high water table [1]	Recommended location of grade line with respect to ground surface	Suitability as	
			A.A.S.H.O.	Unified				Topsoil [2]	s n
		Percent				*Feet*			
Tunkhannock flaggy loam.	4 to 30 feet of well-drained flaggy loam and flaggy sandy loam over bedrock.	3–20	A–2 or A–4	SM or ML	Fair	6–8	Location influenced by great depth to bedrock.	Not suitable. [4]	I
Tunkhannock gravelly loam.	6 to 30 feet of well-drained gravelly loam, containing cobbles at lower depths, over bedrock.	0–12	A–2 or A–4	GM, SM, or ML.	Fair	6–8	Same	Fair to good. [4]	I
Unadilla	2½ to 4 feet of well-drained sandy or silt loam to sandy clay over stratified sand and gravel containing lenses of silt and clay. Depth to bedrock 5 to 20 feet.	0–3	A–4 or A–6 over A–1, A–2 or lenses of A–4 or A–6.	ML or CL over GP, GM, SP, or SM (lenses of ML or CL).	Limited	4–10	4 feet minimum above water table.	Good	I
Vrooman	2 to 3 feet of well-drained sandy loam or silt loam over stratified sand and gravel containing lenses of silt and sandy loam. Depth to bedrock 6 to 20 feet.	0–3	A–2 or A–4 over A–1, A–2, or A–3 (lenses of A–4).	SM or ML over GP, GM, SP, or SM (lenses of ML).	Fair	4–10	Same	Good	I

[1] Deep means that water table is at depth of at least 15 feet, but may be greater than 30 feet.

[2] Ratings given for sources of topsoil for use on embankment and cut slopes and in ditches were developed for this county. Normally, only the material from the uppermost layer will be used.

[3] Specification 3.11.2 of Department of Highways S of Pennsylvania, 1954 (*5*).

[4] Rating depends upon content of coarse fragment

Because of the high percentage of rock fragments and the shallow depth to bedrock of some soils, highway excavation often can be continued throughout the winter, provided the required standards of construction are maintained with respect to compaction of soils and the exclusion of frozen material. The ratings of adaptability to winter grading given in table 13 are for the soil material and not the excavation of the underlying rock.

Where highway cuts are planned in the soil units having a perched water table, a survey should be made to determine the need for interceptor drains and underdrains. Seepage in the backslopes of cuts may result in slumping or sliding of the overlying material. If the perched water table is only a slight depth below the pavement, differential volume change may occur, particularly within the depth of freezing, and the decrease in bearing capacity of the saturated or thawed foundation material may cause deterioration of the pavement.

In upland areas, it is common practice to establish the vertical location of the roads so that a minimum amount of rock excavation will be required; this may require slight embankment sections in much of the upland. A raised gradeline for roads in the upland also promotes the removal of snow by the wind or by road maintenance equipment. Considerable excavation (sidehill cut) in bedrock is required where the roads traverse the valley walls. The unweathered bedrock will normally require blasting before it can be excavated. Seepage may occur in the roadway cuts where sandstone is interbedded with shale, and where the glacial till overlies bedrock.

The ratings given the soils for suitability as sources of topsoil apply to Potter County. These ratings are for materials used on embankment and cut slopes and in ditches of highways. In addition to being fertile, the topsoil material should not contain stones larger than about 2 inches in any dimension. Hence, many of the soils are rated poor or not suitable because of their high content of coarse stone fragments.

Frost action is a major problem of soil engineering in the county. Provision should be made for adequate surface and underdrainage systems, and coarse-grained soil materials that are not susceptible to frost action should be used in the upper part of the subgrade or pavement foundation. Many soils have been given a rating of "limited" for their suitability as a source of special subgrade material because they contain enough silt or clay to make them susceptible to frost.

Some of the gravelly material of the terraces, glaciofluvial deposits, bottom lands, and riverwash has been used for surfacing secondary roads and in base courses for both secondary and primary roads. However, the use of these materials in base courses for primary roads requires considerable inspection control. The shale content of all the gravelly soils may cause the materials to be unsuitable for use in high-type bituminous surfaces for roads or for use in concrete. The residual soil materials that are stony and channery have been used in base courses for primary and secondary roads and are used for surfacing local farm roads.

Peat and muck have low strength and occur in areas where the water table is normally high; therefore, they are not suitable for use in foundations of roads or other engineering structures. Roads normally should be alined to avoid deep peat or muck. The peat and muck within roadway cut sections should be wasted, and that in embankment sites or below the gradeline in cut sections should be removed and replaced by a suitable soil material. Most of the peat and muck that has been delineated on the soil map is north of Eleven Mile, but small unmapped areas of these materials are included in the Woostern, Chenango, and Mardin soils.

The soils of the bottom lands are subject to flooding, and roadways constructed in these lowlands need a continuous embankment to place them above the high water level. Suitable materials for use in these embankments may be borrowed from the adjacent bottom land or from the glacial and residual soils of the terraces and valley walls.

At many construction sites, major variations in the soil may occur within the depth of proposed excavation and several soil units may occur within a short distance. The soil maps and profile descriptions, as well as the engineering data and recommendations given in this section, should be used in planning detailed surveys of soils at construction sites. The soil survey report will enable the soils engineer to concentrate on the most suitable soil units and take a minimum number of soil samples for laboratory testing. Therefore, an adequate soil investigation can be made at minimum cost.

Glossary

A horizon. In a mineral soil, the surface layer, in which the biological activity or eluviation, or both, is greatest.

Acid soil. A soil that is acid throughout most, or all, of the parts occupied by plant roots. Practically, a soil more acid than pH 6.6; precisely, a soil with a pH value of less than 7.0.

Alluvial soils. A great soil group of soils of the azonal order. These soils are forming in material recently deposited by water. The soil-forming processes have modified this material little or none, and Alluvial soils have little profile development.

Alluvium. Fine material, such as sand, mud, or other sediment, deposited on land by streams.

Azonal soils. Soils that have little or no profile development because of their youth, condition of parent material, or relief. Alluvial soils and Lithosols are azonal soils.

Bedrock. The solid rock that underlies soils and other surface formations.

Bleicherde. The principal gray or light-colored leached layer (A_2) in Podzols.

Brown Forest soils. A great soil group of soils of the intrazonal order. These soils have a very dark brown surface horizon that is relatively rich in humus. The surface horizon grades to lighter colored layers, which in turn grade to the parent material. Brown Forest soils developed under deciduous forest in temperate humid regions from parent material relatively rich in bases, particularly calcium.

C horizon. The unconsolidated rock material in the lower part of the soil profile.

Catena. A group of soils within a specific soil zone, the soils of which developed from similar parent material. Because of differences in relief or drainage, however, these soils have dissimilar characteristics.

Clay. (1) The smallest mineral soil grain (less than 0.002 mm. in diameter); (2) as a soil textural class, soil material that contains 40 percent or more of clay and less than 45 percent sand and less than 40 percent silt.

Colluvium. Mixed deposits of rock fragments and soil material accumulated at the base of slopes. These deposits accumulated through soil creep, slides, and local wash.

Consistence. Cohesiveness or resistance to forces that tend to disrupt a soil aggregate. The relative mutual attraction of the particles in the soil mass, or their resistance to separation. Consistence is described by such terms as *loose, friable, plastic, hard, firm,* and *cemented.*

Contour cultivation. Furrows are plowed at right angles to the direction of slope at comparatively close intervals. In contour plowing the plowman keeps a level line at right angles to the direction of slope. The furrows and ridges intercept and retain water and therefore lessen erosion and improve moisture relations.

Detritus. Any loose material that results directly from rock disintegration. Forest detritus is a mass of twigs and leaves that forms the forest floor.

Drift. Any kind of rock material that has been deposited in one place after having been moved from another. Glacial drift is a deposit of earth, sand, gravel, and boulders transmitted by glaciers. Glaciofluvial drift is transferred by glacial melt water, or water flowing from glaciers.

Duff. The matted, partly decomposed organic surface layer of forested soils.

Eluviation. The movement of material in either true solution or colloidal suspension within the soil. Eluvial horizons are those that have lost material through eluviation, and illuvial horizons are those that have received material. With an excess of rainfall over evaporation, eluviation may take place either downward or laterally, according to the direction of water movement. The term "eluviation" refers especially, but not exclusively, to the movement of soil colloids in suspension. Leaching refers to the removal of soluble materials, such as salt, in true solution.

Fertility, soil. The quality that enables a soil to provide the proper compounds in adequate amounts and proper balance for the growth of specified plants, when other factors such as light, temperature, and the physical condition of the soil, are favorable.

First bottom. The normal flood plain of a stream that may be subject to frequent or occasional flooding.

Flood plain. The nearly level land along streams that overflow.

Friable. A term used to describe consistence of a soil. Easily crumbled in fingers; nonplastic.

Genesis, soil. The mode of origin of a soil, with special reference to the processes responsible for the development of the solum, or true soil, from the unconsolidated parent material.

Gleization. A general term for the process of soil formation under excessive moisture that results in a soil with a gley horizon in the lower part of the solum. The gley horizon is generally bluish gray or olive gray and more or less sticky and compact. It is often structureless.

Great soil group. A group of soils having common internal characteristics. Examples: Chernozems, Gray-Brown Podzolic soils, and Podzols.

Green-manure crop. Any crop grown and plowed under for the purpose of improving the soil, especially by the addition of organic matter.

Half-bog soils. A great soil group of the intrazonal order. These soils have a mucky or peaty surface soil underlain by gray mineral soil. Half-bog soils have developed largely under swamp-forest vegetation, mostly in a humid or subhumid climate.

Hardpan. An indurated or cemented soil horizon. The soil material may be sandy or clayey and may be cemented by iron oxide, silica, calcium carbonate, or other substances.

Horizon. A layer of soil approximately parallel to the surface. The layer has more or less well-defined characteristics caused by the soil-forming processes.

Humus. The well-decomposed, more or less stable part of the organic matter in soils.

Igneous rock. Rock produced through the cooling of melted mineral matter.

Intrazonal soils. Any one of the great group of soils having more or less well developed soil characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of climate and vegetation. Each group of intrazonal soils may be associated with two or more of the zonal soils.

Kame. A short ridge, hill, or hillock of stratified drift. Most kames are hilly and interspersed with depressions, called kettles, that have no surface drainage.

Land. The total natural and cultural environment within which production must take place. Land is a broader term than soil. In fact, land includes soil. In addition to soil, land includes climate, water supply, minerals, relief, and location in relation to centers of commerce and population.

Agricultural. Land in farms regularly used for agricultural production. Agricultural land includes all land used for crop or livestock enterprises; that is, farmsteads, lanes, drainage and irrigation ditches, cropland, and grazing land. It should not be used as a synonym for land in farms, cropland, pasture land, or land suitable for crops.

Arable. Land, which without clearing or other major improvement, can produce crops that require tillage.

Cropland. Land regularly used for crops, except forest crops. Cropland includes rotation pasture, cultivated summer fallow, and other land used for crops that is temporarily idle.

Forest. Land not in farms having stands of trees that are, or at maturity will attain, a maximum height of 6 feet; or land from which such a stand has been removed but on which no other use has been substituted. Forest on farms is called woodland or farm forest.

Leaching. The removal of materials in solution by percolating water.

Lithosol. A great soil group of soils of the azonal group. These soils have little or no evidence of soil development and consist mainly of a partly weathered mass of rock fragments.

Mature soil. A soil, nearly in equilibrium with its environment, in which the natural processes of soil formation have produced well-developed characteristics.

Mineral soil. A general term for a soil composed chiefly of mineral matter.

Morphology, soil. The physical constitution of the soil, including the texture, structure, consistence, color, and other physical and chemical properties of the various soil horizons that make up the soil profile.

Muck. Fairly well decomposed organic soil material that is relatively high in minerals and dark in color. Muck accumulates under conditions of impaired drainage.

Neutral soil. A soil that is not significantly acid or alkaline. Strictly, a soil that has a pH of 7.0; practically, one having a pH between 6.3 and 7.3.

Normal soil. A soil having a profile in near equilibrium with its environment, which developed under good but not excessive drainage from parent material of mixed mineral and chemical composition, and which expresses in its characteristics the full forces of climate and living matter.

Nutrient, plant. Any element essential to growth that is taken in by a plant and used for the elaboration of its food and tissue. From the air plants take in the essential elements—carbon, hydrogen, and oxygen. From the soil, plants take nitrogen, phosphorus, calcium, potassium, magnesium, sulfur, iron, manganese, copper, boron, zinc, molybdenum, vanadium, and perhaps sodium and chlorine. Plants also take in other elements, such as iodine and cobalt, that have no known functions, but which are essential to animals.

Organic soils. A general term used for a soil that consists mainly of organic matter.

Ortstein. Pans cemented with iron and organic matter.

Orterde. Horizons that have accumulations of iron and organic matter but are not cemented.

Oxidation. A chemical change involving the addition of oxygen or its chemical equivalent to an element or compound; more technically, a chemical change that involves an increase of positive or a decrease of negative valence.

Parent material. The unconsolidated mass from which the soil profile develops.

Parent rock. The rock from which parent materials of soils are formed.

Peat. Unconsolidated soil material consisting largely of undecomposed or slightly decomposed organic matter accumulated under conditions of excessive moisture.

Peneplain. A land surface reduced by erosion almost to base level so that most of it is approximately a plain. In physiography the term "peneplain" signifies old land surfaces which were formerly reduced almost to base level and subsequently raised to a higher level.

pH. A numerical designation for weak acidity and alkalinity in soils and other biological systems. A pH of 7.0 indicates precise neutrality, higher values indicate alkalinity, and lower values indicate acidity. *See* Reaction, soil.

Phase, soil. The lowest subdivision in soil classification. A soil type that has variations, significant to the use and management of a soil but not great enough to warrant classifying the soil into another type, may be subdivided into a soil phase. In Potter County this classification is usually based on differences in slope and stoniness and on variation in thickness of layers caused by erosion.

Plastic. Capable of being molded without rupture.

Platy. A term used to describe the structure of a soil that has aggregates with thin vertical axes and long horizontal axes.

Podzol. A great soil group of the zonal order. These soils developed under a coniferous or mixed forest or under heath vegetation in a temperate to cold moist climate.

Reaction, soil. The degree of acidity or alkalinity of a soil mass expressed in either pH value and words as follows (*15*):

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 8.0
Strongly acid	5.1 to 5.5	Strongly alkaline	8.1 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		

Red Podzolic soil. Formerly a great soil group of the zonal order that was made up of soils that have thin organic and organic-mineral layers over a yellowish-brown leached horizon that rests upon an illuvial red horizon. The soils developed under deciduous or mixed deciduous and coniferous forests in a warm to warm-temperate humid climate. These soils are now placed in the Red-Yellow Podzolic group.

Reduction. Any chemical change involving the removal of oxygen or its chemical equivalent. More technically, any chemical change involving a decrease of positive or an increase of negative valence.

Residual material. Unconsolidated and partly weathered parent material, presumably developed from the same kind of rock as that on which the soil lies. The term "residual" is sometimes incorrectly applied to soils.

Sand. (1) Individual rock or mineral fragments that have diameters between 0.05 and 2.0 mm.; (2) the textural class name of any soil that contains 85 percent or more of sand and not more than 10 percent of clay.

Second bottom. The terrace level along a stream valley that lies immediately above the flood plain. This terrace is rarely flooded.

Sedimentary rock. A rock composed of particles deposited from water. The chief groups of sedimentary rocks are (1) conglomerates, from gravels; (2) sandstones, from sand; (3) shales, from clays; and (4) limestone, from deposited calcium carbonate. There are many intermediate types of sedimentary rock.

Series, soil. A group of soils that, except for the texture of their surface soil, are similar in profile characteristics and in horizon arrangement. The soils of one series have developed from similar parent material. A series may include two or more soil types, which differ primarily in texture of the surface soil.

Silt. (1) Small mineral grains of soil, which range in diameter from 0.05 to 0.002 mm.; (2) soils of the silt textural class, which contain 80 percent or more of silt and less than 12 percent of clay.

Soil. The natural medium for the growth of land plants. It is a natural body of organic and mineral materials in which plants grow.

Soil climate. Moisture and temperature conditions within the soil.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. In mature soils the solum includes the A and B horizons. Usually the characteristics of the material in these horizons is quite unlike those of the underlying parent material. The roots and other plant and animal life in a soil are generally in the solum.

Stratified. Composed of, or arranged in, strata or layers, as stratified alluvium. The term is confined to geological materials. Those layers in the soil that are the result of soil-forming processes are called horizons; those inherited from the parent material are called strata.

Stripcropping. The practice of growing crops in a systematic arrangement of strips or bands. Tilled crops and sod crops are alternated in strips to protect the soil and vegetation against running water or wind.

Structure, soil. The aggregation of primary soil particles into compound particles, or into clusters of primary particles. The aggregates are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are *platy, prismatic, columnar, blocky,* and *granular.*

Subsoil. Roughly that part of the solum below plow depth.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness.

Talus. Fragments of rock and soil material accumulated at the foot of cliffs or steep slopes, chiefly through the action of gravity.

Terrace (for control of runoff or soil erosion or both). An embankment or ridge constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so it may infiltrate, or it transmits the flow to an outlet so that the water will not cause erosion.

Texture, soil. The relative proportions of the various size groups of individual soil grains in a mass of soil. Specifically, texture refers to the proportions of sand, silt, and clay.

Till, glacial. A deposit of earth, sand, gravel, and boulders transported by glacier. Till is not stratified.

Topsoil. A general term applied to the surface portion of the soil, including the material to average plow depth, or the A horizon where it is deeper than plow depth. Topsoil cannot be precisely defined as to depth or productivity, except in reference to a particular soil type.

Transitional soil. Soil that does not clearly belong to any important soil group or series with which it is associated.

Type, soil. (1) A subgrouping under the soil series based on texture of the surface soil; (2) a group of soils having horizons similar in differentiating characteristics and arrangement in the soil profile, and developed from a particular kind of soil material.

Vesicular structure. Soil structure characterized by round or egg-shaped cavities or vesicles.

Zonal soil. A soil having well-defined soil characteristics that reflect the influence of the active factors of soil formation, especially climate and vegetation.

Literature Cited

(1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1955. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 7, 2 vols., Washington, D. C.

(2) BEAR, F. E. (ed.)
1949. Soil Sci. 67: 77–191 [articles on soil classification].

(3) CARLISLE, F. J., JR.
1954. CHARACTERISTICS OF SOILS WITH FRAGIPANS IN A PODZOL REGION. Thesis, Ph.D., Cornell Univ. [Processed.]

(4) COMMONWEALTH OF PENNSYLVANIA, STATE DEPARTMENT OF COMMERCE
1946. MY PENNSYLVANIA. 165 pp., illus., Harrisburg, Pa.

(5) ———. DEPARTMENT OF HIGHWAYS.
1954. SPECIFICATIONS.

(6) DENNY, C. S.
1951. PLEISTOCENE FROST ACTION NEAR THE BORDER OF THE WISCONSIN DRIFT IN PENNSYLVANIA. Ohio Jour. Sci. 51: 116–125.

(7) ———.
1956. SURFICIAL GEOLOGY AND GEOMORPHOLOGY OF POTTER COUNTY, PENNSYLVANIA. U. S. Geol. Survey Prof. Paper 288. 72 pp., illus.

(8) GARDNER, D. R. AND WHITESIDE, E. P.
1952. ZONAL SOILS IN THE TRANSITION REGION BETWEEN THE PODZOL AND GRAY BROWN PODZOLIC REGION IN MICHIGAN. Soil Sci. Amer. Proc. 16: 137–141.

(9) GOODLETT, J. C.
1954. VEGETATION ADJACENT TO THE BORDER OF THE WISCONSIN DRIFT IN POTTER COUNTY, PENNSYLVANIA. Harvard Univ., Harvard Forest Bul. 25, 93 pp. illus.

(10) GOODMAN, K. V.
1953. BROWN FOREST, POLYGENETIC AND CONGELITURBATE PROFILES OF POTTER COUNTY, PENNSYLVANIA. Soil Sci. Am. Proc. 17: 399–402.

(11) KELLOGG, C. E.
1954. THE SOILS THAT SUPPORT US. 370 pp., illus. New York.

(12) LONGWELL, C. R., KNOPF, A., FLINT, R. F. SCHUCHERT, C. R., AND OTHERS.
1941. TEXTBOOK OF GEOLOGY. 2 vols., New York.

(13) MACCLINTOCK, P. AND APFEL, E. T.
1944. CORRELATION OF THE DRIFTS OF THE SALAMANCA REENTRANT, NEW YORK. Geol. Soc. Amer. Bul. 55: 1143–1164.

(14) UNITED STATES DEPARTMENT OF AGRICULTURE
1938. SOILS AND MEN. U. S. Dept. Agr. Yearbook 1938, 1232 pp., illus.

(15) ———.
1951. SOIL SURVEY MANUAL. U. S. Dept. Agr. Handbook 18. 503 pp., illus.

(16) WATERWAYS EXPERIMENT STATION
1953. UNIFIED SOIL CLASSIFICATION SYSTEM. 3 vols., Corps. of Engin., U. S. Army, Tech. Memo. 3–357. Prepared for Off., Chief of Engin., Vicksburg, Miss.

(17) YEARICK, L. G.
1949. SOME PHYSICAL AND MINERALOGICAL CHARACTERISTICS OF FOUR MATURE SOILS DERIVED FROM ILLINOIAN AND WISCONSIN DRIFT-SHEETS IN NORTHERN PENNSYLVANIA. Thesis, M. S., Penn. State Col.

Soils of Potter County, Pa.:

Soil	Map Symbol	Physiographic position	Parent material	Depth of soil to bedrock		Internal drainage
				Average	Range	
				Feet	*Feet*	
Barbour fine sandy loam, 0 to 3 percent slopes.	Ba	Bottom lands	Stream-worked silt, sand, and gravel.	4+	3–5+	Well drained
Barbour fine sandy loam, high bottom phase, 0 to 3 percent slopes.	Bb	Bottom lands	Same	4+	3–5+	Well drained
Barbour gravelly fine sandy loam, 0 to 3 percent slopes.	Bc	Bottom lands	Same	4+	3–5+	Somewhat excessively drained.
Basher sandy loam, 0 to 3 percent slopes	Bd	Bottom lands	Same	4+	3–5+	Moderately well drained
Basher silt loam, 0 to 3 percent slopes	Be	Bottom lands	Same	4+	3–5+	Moderately well drained
Basher silt loam, high bottom phase, 0 3 percent slopes.	Bf	Bottom lands	Same	4+	3–5+	Moderately well drained
Bath channery silt loam, 0 to 12 percent slopes.	Bg	Uplands	Wisconsin glacial till or frost-worked materials from sandstone and siltstone.	5	3–10+	Well drained
Bath channery silt loam, 12 to 20 percent slopes.	Bh	Uplands	Same	5	3–10+	Well drained
Bath channery silt loam, 20 to 30 percent slopes.	Bk	Uplands	Same	5	3–10+	Well drained
Bath channery silt loam, 30 to 40 percent slopes.	Bm	Uplands	Same	5	3–10+	Well drained
Braceville gravelly silt loam, 0 to 5 percent slopes.	Bn	Glaciofluvial terraces and fans.	Water-worked silt, sand, and gravel.	6+	4–15+	Moderately well drained
Brinkerton and Armagh silt loams, 0 to 15 percent slopes.	Bo	Uplands	Compact glacial till or frost-worked materials from shale and siltstone.	4	3–6+	Poorly drained
Brinkerton and Armagh silt loams, 15 to 50 percent slopes.	Bp	Uplands	Same	4	3–6	Poorly drained
Cattaraugus channery loam, 0 to 12 percent slopes.	Ca	Uplands	Glacial till or frost-worked materials from sandstone and siltstone.	6	4–20+	Well drained
Cattaraugus channery loam, 12 to 20 percent slopes.	Cb	Uplands	Same	6	4–20+	Well drained
Cattaraugus channery loam, 20 to 30 percent slopes.	Cc	Uplands	Same	6	4–20	Well drained
Cattaraugus channery loam, 30 to 40 percent slopes.	Cd	Uplands	Same	6	4–20+	Well drained
Cattaraugus stony loam, 0 to 20 percent slopes.	Ce	Uplands	Glacial till or frost-worked materials.	6	4–20	Well drained
Cattaraugus stony loam, 20 to 30 percent slopes.	Cf	Uplands	Same	6	4–20	Well drained
Cattaraugus and Lackawanna channery loams, 40 to 60 percent slopes.	Cg	Uplands	Glacial till or frost-worked materials from sandstone and siltstone.	6	4–20	Well drained
Cattaraugus and Lackawanna stony loams, 30 to 60 percent slopes.	Ch	Uplands	Glacial till or frost-worked materials.	6	4–20	Well drained
Cavode channery silt loam, 0 to 8 percent slopes.	Ck	Uplands	Residuum from shale and siltstone.	2½	1–4	Somewhat poorly drained
Cavode channery silt loam, 8 to 15 percent slopes.	Cm	Uplands	Same	2½	1–4	Somewhat poorly drained
Cavode channery silt loam, 15 to 25 percent slopes.	Cn	Uplands	Same	2½	1–4	Somewhat poorly drained
Cavode silt loam, 0 to 8 percent slopes	Co	Uplands	Same	2½	1–4	Somewhat poorly drained
Cavode silt loam, 8 to 15 percent slopes	Cp	Uplands	Same	2½	1–4	Somewhat poorly drained
Cavode silt loam, 15 to 25 percent slopes	Cr	Uplands	Same	2½	1–4	Somewhat poorly drained
Cavode stony silt loam, 0 to 15 percent slopes.	Cs	Uplands	Same	2	½–3	Somewhat poorly drained
Cavode stony silt loam, 15 to 50 percent slopes.	Ct	Uplands	Same	2	½–3	Somewhat poorly drained
Chenango gravelly loam, 0 to 12 percent slopes.	Cu	Glaciofluvial terraces and stream fans.	Sand and gravel from Wisconsin glacial meltwater and streams.	10+	5–30+	Somewhat excessively drained.
Chenango gravelly loam, 12 to 20 percent slopes.	Cv	Same	Same	10+	5–30+	Same

Summary of important characteristics

Reaction	Surface soil		Subsoil		
	Color	Consistency	Color	Texture	Permeability
Strongly acid	Reddish brown	Very friable	Red or dark red	Fine sandy loam	Rapid to moderately rapid.
Strongly acid	Reddish brown	Friable	Red or dark red	Fine sandy loam	Rapid to moderately rapid.
Strongly acid	Reddish brown	Loose	Red or dark red	Gravelly sandy loam	Very rapid.
Strongly acid	Dark brown or reddish brown.	Friable	Light yellowish brown mottled with yellow and red.	Fine sandy loam	Moderate to moderately slow.
Strongly acid	Reddish brown or yellowish brown.	Friable	Same	Silty clay loam	Moderately slow.
Strongly acid	Brown	Friable	Reddish brown or yellowish brown.	Silty clay loam	Moderately slow.
Strongly to very strongly acid.	Dark grayish brown or yellowish brown.	Friable	Yellowish brown	Channery silt loam	Rapid to moderately rapid.
Same	Same	Friable	Yellowish brown	Channery silt loam	Rapid to moderately rapid.
Same	Same	Friable	Yellowish brown	Channery silt loam	Rapid to moderately rapid.
Same	Same	Friable	Yellowish brown	Channery silt loam	Rapid to moderately rapid.
Strongly acid	Dark brown	Very friable	Yellowish red mottled with yellow.	Gravelly silt loam	Moderate.
Very strongly acid	Dark grayish brown	Friable	Mottled gray, yellow, and brown.	Silty clay loam	Slow to very slow.
Very strongly acid	Same	Friable	Same	Silty clay loam	Slow to very slow.
Extremely to strongly acid.	Reddish brown or yellowish red.	Friable	Yellowish red or strong brown.	Channery or flaggy loam.	Rapid to moderately rapid.
Same	Same	Friable	Same	Channery or flaggy loam.	Rapid to moderately rapid.
Same	Same	Friable	Same	Channery or flaggy loam.	Rapid to moderately rapid.
Same	Same	Friable	Same	Channery or flaggy loam.	Rapid to moderately rapid.
Very strongly or strongly acid.	Black to light gray	Friable	Same	Channery or flaggy loam.	Rapid to moderately rapid.
Same	Same	Friable	Same	Channery or flaggy loam.	Rapid to moderately rapid.
Extremely to strongly acid.	Reddish brown, yellowish red, or weak red.	Friable	Red, yellowish red, or strong brown.	Channery or flaggy loam.	Rapid to moderately rapid.
Very strongly to strongly acid.	Black, light gray, or weak red.	Friable	Same	Channery or flaggy loam.	Rapid to moderately rapid.
Very strongly acid	Very dark gray	Friable	Mottled gray and yellow.	Channery silty clay loam.	Slow.
Very strongly acid	Very dark gray	Friable	Same	Channery silty clay loam.	Slow.
Very strongly acid	Very dark gray	Friable	Same	Channery silty clay loam.	Slow.
Very strongly acid	Dark gray	Friable	Mottled brownish yellow and gray.	Silty clay	Slow.
Very strongly acid	Dark gray	Friable	Same	Silty clay	Slow.
Very strongly acid	Dark gray	Friable	Same	Silty clay	Slow.
Very strongly acid	Very dark gray	Friable	Same	Shaly silty clay	Slow.
Very strongly acid	Very dark gray	Friable	Same	Shaly silty clay	Slow.
Strongly acid	Yellowish brown	Friable	Same	Gravelly loam	Very rapid.
Strongly acid	Yellowish brown	Friable	Same	Gravelly loam	Very rapid.

Soils of Potter County, Pa.:

Soil	Map Symbol	Physiographic position	Parent material	Depth of soil to bedrock		Internal drainage
				Average	Range	
				Feet	*Feet*	
Chenango gravelly loam, 20 to 50 percent slopes.	Cw	Same	Same	10+	5–30+	Same
Chippewa silt loam, 0 to 8 percent slopes.	Cx	Uplands	Compact glacial till, frost-worked, or residual materials from shale and sandstone.	5	4–20+	Very poorly drained
Chippewa stony silt loam, 0 to 8 percent slopes.	Cy	Uplands	Same	5	4–20	Very poorly drained
Clymer channery loam, 0 to 12 percent slopes.	C2a	Uplands	Residuum from coarse- and fine-grained sandstone.	3	2–6	Well drained
Clymer channery loam, 12 to 20 percent slopes.	C2b	Uplands	Same	3	2–6	Well drained
Clymer channery loam, 20 to 30 percent slopes.	C2c	Uplands	Same	3	2–6	Well drained
Clymer stony loam, 0 to 20 percent slopes.	C2d	Uplands	Same	3	2–6	Well drained
Clymer stony loam, 20 to 30 percent slopes.	C2e	Uplands	Same	3	2–6	Well drained
Cookport channery loam, 0 to 8 percent slopes.	C2f	Uplands	Residuum from gray or brown sandstone and siltstone.	3	2–6	Moderately well drained
Cookport channery loam, 8 to 15 percent slopes.	C2g	Uplands	Same	3	2–6	Moderately well drained
Cookport channery loam, 15 to 25 percent slopes.	C2h	Uplands	Same	3	2–6	Moderately well drained
Cookport stony loam, 0 to 15 percent cent slopes.	C2k	Uplands	Same	3	2–6	Moderately well drained
Cookport stony loam, 15 to 25 percent slopes.	C2m	Uplands	Same	3	2–6	Moderately well drained
Cookport stony loam, 25 to 50 percent slopes.	C2n	Uplands	Same	3	2–6	Moderately well drained
Culvers channery silt loam, 0 to 8 percent slopes.	C2o	Uplands	Glacial till or frost-marked materials from sandstone and siltstone.	6+	4–20+	Moderately well drained
Culvers channery silt loam, 8 to 15 percent slopes.	C2p	Uplands	Same	6+	4–20+	Moderately well drained
Culvers channery silt loam, 15 to 25 percent slopes.	C2r	Uplands	Same	6	4–20+	Moderately well drained
Culvers channery silt loam, 25 to 35 percent slopes.	C2s	Uplands	Same	6	4–20	Moderately well drained
Culvers stony silt loam, 0 to 15 percent slopes.	C2t	Uplands	Same	6+	4–20+	Moderately well drained
Culvers stony silt loam, 15 to 25 percent slopes.	C2u	Uplands	Same	6+	4–20+	Moderately well drained
Culvers stony silt loam, 25 to 35 percent slopes.	C2v	Uplands	Same	6	4–20+	Moderately well drained
Culvers and Wellsboro channery silt loams, 35 to 50 percent slopes.	C2w	Uplands	Same	6	4–20	Moderately well drained
Dekalb channery loam, 10 to 25 inches deep, 0 to 12 percent slopes.	Da	Uplands	Residuum from gray sandstone and shale.	1	0–2	Well to somewhat excessively drained.
Dekalb channery loam, 10 to 25 inches deep, 12 to 20 percent slopes.	Db	Uplands	Same	1	0–2	Same
Dekalb channery loam, 10 to 25 inches deep, 20 to 30 percent slopes.	Dc	Uplands	Same	1	0–2	Same
Dekalb channery loam, 40 or more inches deep, 0 to 12 percent slopes.	Dd	Uplands	Same	3½	2–5	Same
Dekalb channery loam, 40 or more inches deep, 12 to 20 percent slopes.	De	Uplands	Same	3½	2–5	Same
Dekalb channery loam, 40 or more inches deep, 20 to 30 percent slopes.	Df	Uplands	Same	3½	2–5	Same
Dekalb channery loam, 40 or more inches deep, 30 to 40 percent slopes.	Dg	Uplands	Same	3½	2–5	Same
Dekalb fine sandy loam, 0 to 12 percent slopes.	Dh	Uplands	Residuum from gray sandstone.	3+	2–7	Somewhat excessively drained.
Dekalb fine sandy loam, 12 to 20 percent slopes.	Dk	Uplands	Same	3+	2–7	Same

Summary of important characteristics—Continued

Reaction	Surface soil		Subsoil		
	Color	Consistency	Color	Texture	Permeability
Strongly acid	Yellowish brown	Friable	Same	Gravelly loam	Very rapid.
Strongly acid	Very dark gray or black.	Friable	Mottled gray and yellow.	Silty clay	Very slow.
Strongly acid	Same	Friable	Same	Silty clay	Very slow.
Very strongly to extremely acid.	Yellowish brown	Friable	Yellowish brown	Loam or sandy loam	Rapid.
Same	Yellowish brown	Friable	Yellowish brown	Loam or sandy loam	Rapid.
Same	Yellowish brown	Friable	Yellowish brown	Loam or sandy loam	Rapid.
Same	Very dark gray or light gray.	Friable	Yellowish brown	Loam or sandy loam	Rapid.
Same	Same	Friable	Yellowish brown	Loam or sandy loam	Rapid.
Very strongly acid	Dark brown	Very friable	Brownish yellow and yellow mottled with grayish brown.	Fine sandy loam or loam.	Moderate.
Very strongly acid	Dark brown	Very friable	Same	Fine sandy loam or loam.	Moderate.
Very strongly acid	Dark brown	Very friable	Same	Fine sandy loam or loam.	Moderate.
Very strongly acid	Very dark gray and pale brownish gray.	Very friable	Same	Fine sandy loam or loam.	Moderate.
Very strongly acid	Same	Very friable	Same	Fine sandy loam or loam.	Moderate.
Very strongly acid	Same	Very friable	Same	Fine sandy loam or loam.	Moderate.
Strongly and very strongly acid.	Dark brown or yellowish brown.	Friable	Yellowish red slightly mottled with gray and yellowish brown.	Channery silt loam or loam.	Moderate.
Same	Same	Friable	Same	Same	Moderate.
Same	Same	Friable	Same	Same	Moderate.
Same	Same	Friable	Same	Same	Moderate.
Same	Dark brown and pale brownish gray.	Friable	Same	Channery or flaggy silt loam or loam.	Moderate.
Same	Same	Friable	Same	Same	Moderate.
Same	Same	Friable	Same	Same	Moderate.
Same	Dark brown or yellowish brown.	Friable	Yellowish red slightly mottled with gray and yellowish brown.	Channery silt loam or loam.	Moderate.
Extremely acid	Dark gray or light gray	Friable	Brownish yellow	Channery loam	Very rapid to rapid.
Extremely acid	Same	Friable	Brownish yellow	Same	Very rapid to rapid.
Extremely acid	Same	Friable	Brownish yellow	Same	Very rapid to rapid.
Extremely acid	Dark brown or brownish yellow.	Friable or very friable.	Yellowish brown	Channery or flaggy loam.	Very rapid to rapid.
Extremely acid	Same	Same	Yellowish brown	Channery or flaggy loam.	Very rapid to rapid.
Extremely acid	Same	Same	Yellowish brown	Channery or flaggy loam.	Very rapid to rapid.
Extremely acid	Same	Same	Yellowish brown	Channery or flaggy loam.	Very rapid to rapid.
Extremely acid	Same	Loose	Yellowish brown	Fine sandy loam	Very rapid.
Extremely acid	Same	Loose	Yellowish brown	Fine sandy loam	Very rapid.

Soils of Potter County, Pa.:

Soil	Map Symbol	Physiographic position	Parent material	Depth of soil to bedrock		Internal drainage
				Average	Range	
				Feet	*Feet*	
Dekalb fine sandy loam, 20 to 30 percent slopes.	Dm	Uplands	Same	3+	2–7	Same
Dekalb stony loam, 10 to 25 inches deep, 0 to 20 percent slopes	Dn	Uplands	Same	−1	0–2	Well to somewhat excessively drained.
Dekalb stony loam, 10 to 25 inches deep, 20 to 30 percent slopes.	Do	Uplands	Same	−1	0–2	Same
Dekalb stony loam, 40 or more inches deep, 0 to 20 percent slopes.	Dp	Uplands	Same	3+	2–5	Same
Dekalb stony loam, 40 or more inches deep, 20 to 30 percent slopes.	Dr	Uplands	Same	3+	2–5	Same
Dilldown sandy loam, 0 to 12 percent slopes.	Ds	Uplands	Residuum from red sandstone.	3	2–6	Well drained
Dilldown sandy loam, 12 to 30 percent slopes.	Dt	Uplands	Same	3	2–6	Well drained
Germania silt loam, 0 to 12 percent slopes.	Ga	Glaciofluvial terraces and fans.	Deeply weathered stream-worked silt, sand, and gravel.	8+	5–30+	Well drained
Germania silt loam, 12 to 20 percent slopes.	Gb	Same	Same	8+	5–30+	Well drained
Germania silt loam, 20 to 30 percent slopes.	Gc	Same	Same	8	5–30+	Well drained
Germania silt loam, 30 to 50 percent slopes.	Gd	Same	Same	8	5–30	Well drained
Holly sandy loam, 0 to 3 percent slopes	Ha	Bottom lands	Stream-worked sand and silt.	4+	3–8+	Poorly drained
Holly silt loam, 0 to 3 percent slopes	Hb	Bottom lands	Same	4+	3–8+	Poorly drained
Lackawanna channery loam, 0 to 12 percent slopes.	La	Uplands	Glacial silt or frost-worked materials from reddish sandstone and siltstone.	6+	4–20+	Well drained
Lackawanna channery loam, 12 to 20 percent slopes.	Lb	Uplands	Same	6+	4–20+	Well drained
Lackawanna channery loam, 20 to 30 percent slopes.	Lc	Uplands	Same	6+	4–20+	Well drained
Lackawanna channery loam, 30 to 40 percent slopes.	Ld	Uplands	Same	6	4–20	Well drained
Lackawanna channery silt loam, 0 to 12 percent slopes.	Le	Uplands	Same	6+	4–20+	Well drained
Lackawanna channery silt loam, 12 to 20 percent slopes.	Lf	Uplands	Same	6+	4–20+	Well drained
Lackawanna channery silt loam, 20 to 30 percent slopes.	Lg	Uplands	Same	6	4–20	Well drained
Lackawanna channery silt loam, 30 to 40 percent slopes.	Lh	Uplands	Same	6	4–20	Well drained
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 0 to 12 percent slopes.	Lk	Uplands	Frost-worked mater- or residuum from reddish sandstones and siltstones.	3	2–4	Well drained
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 12 to 20 percent slopes.	Lm	Uplands	Same	3	2–4	Well drained
Lackawanna channery silt loam, 25 to 40 inches deep, residual variant, 20 to 30 percent slopes.	Ln	Uplands	Same	3	2–4	Well drained
Lackawanna stony loam, 0 to 20 percent slopes.	Lo	Uplands	Till and frost-worked materials from red sandstone and siltstone.	6	4–20	Well drained
Lackawanna stony loam, 20 to 30 percent slopes.	Lp	Uplands	Same	6	4–20	Well drained
Leetonia stony loamy sand, 0 to 20 percent slopes.	Ls	Uplands	Residuum from quartz conglomerate and gray coarse sandstone.	2	1–3	Excessively drained
Leetonia stony loamy sand, 20 to 30 percent slopes.	Lt	Uplands	Same	2	1–3	Excessively drained
Leetonia channery loamy sand and Dekalb channery loam, 30 to 60 percent slopes.	Lr	Uplands	Same	2	1–3	Excessively drained
Leetonia and Dekalb very stony soils, 0 to 20 percent slopes.	Lu	Uplands	Same	2	1–3	Excessively drained
Leetonia and Dekalb very stony soils, 20 to 30 percent slopes.	Lv	Uplands	Same	2	1–3	Excessively drained

Summary of important characteristics—Continued

Reaction	Surface soil		Subsoil		
	Color	Consistency	Color	Texture	Permeability
Extremely acid	Same	Loose	Yellowish brown	Fine sandy loam	Very rapid.
Extremely acid	Very dark gray and light gray.	Very friable and friable.	Yellowish brown	Stony loam	Very rapid to rapid.
Extremely acid	Same	Same	Yellowish brown	Stony loam	Very rapid to rapid.
Very strongly acid	Same	Same	Yellowish brown	Stony loam	Very rapid to rapid.
Very strongly acid	Same	Same	Yellowish brown	Stony loam	Very rapid to rapid.
Extremely acid	Reddish gray	Loose	Dark reddish brown	Sandy loam	Rapid.
Extremely acid	Reddish gray	Loose	Dark reddish brown	Sandy loam	Rapid.
Strongly acid	Brown or reddish brown	Very friable	Reddish brown or yellowish red.	Silt loam	Moderately rapid.
Strongly acid	Same	Very friable	Same	Silt loam	Moderately rapid.
Strongly acid	Same	Very friable	Same	Silt loam	Moderately rapid.
Strongly acid	Same	Very friable	Same	Silt loam	Moderately rapid.
Strongly acid	Dark gray or grayish brown.	Very friable	Mottled gray, brown and yellow.	Sandy loam	Slow.
Strongly acid	Same	Very friable	Same	Silt loam	Slow.
Strongly acid	Dark red	Friable	Red to purplish red	Channery loam	Moderately rapid.
Strongly acid	Dark red	Friable	Same	Channery loam	Moderately rapid.
Strongly acid	Dark red	Friable	Same	Channery loam	Moderately rapid.
Strongly acid	Dark red	Friable	Same	Channery loam	Moderately rapid.
Very strongly acid	Weak red	Very friable	Reddish brown	Channery silt loam	Moderately rapid.
Very strongly acid	Weak red	Very friable	Reddish brown	Channery silt loam	Moderately rapid.
Very strongly acid	Weak red	Very friable	Reddish brown	Channery silt loam	Moderately rapid.
Very strongly acid	Weak red	Very friable	Reddish brown	Channery silt loam	Moderately rapid.
Very strongly acid	Dark reddish gray or weak red.	Very friable	Red	Channery silt loam	Moderately rapid.
Very strongly acid	Same	Very friable	Red	Channery silt loam	Moderately rapid.
Very strongly acid	Same	Very friable	Red	Channery silt loam	Moderately rapid.
Very strongly acid	Weak red	Friable	Red	Channery loam	Moderately rapid.
Very strongly acid	Weak red	Friable	Red	Channery loam	Moderately rapid.
Extremely acid	Black and white	Loose	Brown and brownish yellow.	Loamy coarse sand	Very rapid.
Extremely acid	Black and white	Loose	Same	Loamy coarse sand	Very rapid.
Extremely acid	Black and white	Loose	Same	Loamy coarse sand	Very rapid.
Extremely acid	Black and white	Loose	Same	Loamy coarse sand	Very rapid.
Extremely acid	Black and white	Loose	Same	Loamy coarse sand	Very rapid.

Soils of Potter County, Pa.:

Soil	Map Symbol	Physiographic position	Parent material	Depth of soil to bedrock		Internal drainage
				Average	Range	
				Feet	*Feet*	
Leetonia and Dekalb very stony soils, 30 to 70 percent slopes.	Lw	Uplands	Same	2	1–3	Excessively drained
Lordstown channery silt loam, 0 to 12 percent slopes.	L2a	Uplands	Glacial till and some postglacial residuum from gray and brown sandstone and siltstone.	2	1–4	Well drained
Lordstown channery silt loam, 12 to 20 percent slopes.	L2b	Uplands	Same	2	1–4	Well drained
Lordstown channery silt loam, 20 to 30 percent slopes.	L2c	Uplands	Same	2	1–4	Well drained
Lordstown channery silt loam, 30 to 40 percent slopes.	L2d	Uplands	Same	2	1–4	Well drained
Lordstown stony loam, 0 to 20 percent slopes.	L2f	Uplands	Glacial till and some postglacial residuum from gray and brown sandstone and siltstone, including large boulders and erratics.	2	1–4	Well drained
Lordstown stony loam, 20 to 30 percent slopes.	L2g	Uplands	Same	2	1–4	Well drained
Lordstown and Bath channery silt loams, 40 to 60 percent slopes.	L2h	Uplands	Glacial till or frost-worked material from sandstone and siltstone.	Varies	Varies	Well drained
Lordstown channery silt loam, neutral variant, 0 to 30 percent slopes.	L2e	Uplands	Residuum or frost-worked materials from calcareous sandstone and sandy limestone.	3	2-4	Well drained
Mardin channery silt loam, 0 to 8 percent slopes.	Ma	Uplands	Glacial till and frost-worked materials from yellow and brown sandstone and siltstone.	6+	4–20+	Moderately well drained
Mardin channery silt loam, 8 to 15 percent slopes.	Mb	Uplands	Same	6+	4–20+	Moderately well drained
Mardin channery silt loam, 15 to 25 percent slopes.	Mc	Uplands	Same	6	4–20+	Moderately well drained
Mardin channery silt loam, 25 to 35 percent slopes.	Md	Uplands	Same	6	4–20	Moderately well drained
Middlebury sandy loam, 0 to 3 percent slopes.	Me	Bottom lands	Recent alluvium, mostly silt and sand.	4+	3–8+	Moderately well drained
Middlebury silt loam, 0 to 3 percent slopes.	Mf	Bottom lands	Same	4+	3–8+	Moderately well drained
Middlebury silt loam, high bottom phase, 0 to 3 percent slopes.	Mg	Bottom lands	Recent alluvium, mostly silt and sand but some gravel.	5+	4–10+	Moderately well drained
Minora silt loam, 0 to 12 percent slopes	Mh	Uplands	Residuum from red shale.	1½	½–3	Well drained
Minora silt loam, 12 to 20 percent slopes	Mk	Uplands	Residuum from red shale.	1½	½–3	Well drained
Minora silt loam, 20 to 30 percent slopes	Mm	Uplands	Residuum from red shale.	1½	½–3	Well drained
Mixed alluvium, 0 to 5 percent slopes	Mn	Bottom lands	Recent stream deposits.	3+	1–5+	Poor to moderately well drained.
Morris silt loam, 0 to 3 percent slopes	Mo	Uplands	Compact glacial till or frost-worked materials from reddish sandstone and siltstone.	6+	4–20+	Poorly drained
Morris silt loam, 3 to 8 percent slopes	Mp	Uplands	Same	6+	4–20+	Poorly drained
Morris silt loam, 8 to 15 percent slopes	Mr	Uplands	Same	6+	4–20+	Poorly drained
Morris silt loam, 15 to 25 percent slopes	Ms	Uplands	Same	6+	4–20+	Poorly drained

Summary of important characteristics—Continued

Reaction	Surface soil		Subsoil		
	Color	Consistency	Color	Texture	Permeability
Extremely acid	Black and white	Loose	Same	Loamy coarse sand	Very rapid.
Strongly acid	Very dark gray	Very friable	Dark brown or yellow	Channery loam; some flaggy areas.	Rapid.
Strongly acid	Very dark gray	Very friable	Same	Same	Rapid.
Strongly acid	Very dark gray	Very friable	Same	Same	Rapid.
Strongly acid	Very dark gray	Very friable	Same	Same	Rapid.
Strongly acid	Very dark gray and light gray.	Loose	Dark brown to yellow	Flaggy loam	Rapid.
Strongly acid	Very dark gray, dark grayish brown or yellowish brown.	Loose	Same	Flaggy loam	Rapid to moderately rapid.
Strongly and very strongly acid.	Same	Loose or friable	Yellowish brown, dark brown or yellow.	Channery silt loam or channery loam.	Same.
Slightly acid	Dark reddish brown	Very friable	Reddish brown	Silt loam	Moderately rapid.
Strongly to medium acid.	Brown or yellowish brown.	Friable	Dark brown mottled with yellow and gray.	Silt loam or clay loam	Slow.
Same	Same	Friable	Same	Same	Slow.
Same	Same	Friable	Same	Same	Slow.
Same	Same	Friable	Same	Same	Slow.
Same	Dark grayish brown	Very friable	Yellowish brown mottled with yellow.	Clay loam	Moderately slow.
Same	Same	Very friable	Same	Silty clay	Moderately slow.
Same	Same	Friable	Same	Silty clay or clay loam	Moderately slow.
Strongly acid	Dark red	Friable	Red to weak red	Channery silty clay	Moderately rapid.
Strongly acid	Dark red	Friable	Same	Channery silty clay	Moderately rapid.
Strongly acid	Dark red	Friable	Same	Channery silty clay	Moderately rapid.
Strongly acid	Dark grayish brown	Loose to firm	Mottled yellow and brown.	Silty or sandy loam	Moderately slow.
Strongly acid	Grayish brown or dark brown.	Firm to very firm.	Mottled olive yellow, yellow, reddish brown and gray.	Silt loam or clay loam.	Slow.
Strongly acid	Same	Same	Same	Silt loam or clay loam.	Slow.
Strongly acid	Same	Same	Same	Silt loam or clay loam.	Slow.
Strongly acid	Same	Same	Same	Silt loam or clay loam.	Slow.

Soils of Potter County, Pa.:

Soil	Map Symbol	Physiographic position	Parent material	Depth of soil to bedrock		Internal drainage
				Average	Range	
				Feet	*Feet*	
Morris silt loam, 25 to 50 percent slopes	Mt	Uplands	Same	6	4–20	Poorly drained
Morris stony silt loam, 0 to 15 percent slopes.	Mu	Uplands	Same	6+	4–20+	Poorly drained
Morris stony silt loam, 15 to 25 percent slopes.	Mv	Uplands	Same	6	4–20	Poorly drained
Morris stony silt loam, 25 to 50 percent slopes.	Mw	Uplands	Same	6	4–20	Poorly drained
Nolo channery silt loam, 0 to 8 percent slopes.	Na	Uplands	Residuum from shale, sandstone, and conglomerate.	3	2–7	Poorly drained
Nolo stony sandy loam, sandy variant, 0 to 12 percent slopes.	Nb	Uplands	Same	4	2–7	Poorly drained
Norwich silt loam, 0 to 15 percent slopes.	Nc	Uplands	Compact reddish glacial till or frost-worked materials.	8+	5–30+	Very poorly drained
Norwich stony silt loam, 0 to 15 percent slopes.	Nd	Uplands	Same	8+	5–30+	Very poorly drained
Oquaga channery loam, 0 to 12 percent slopes.	Oa	Uplands	Glacial till and some postglacial residuum from reddish-brown, brown, and greenish sandstone and siltstone.	2	1–3	Well drained
Oquaga channery loam, 12 to 20 percent slopes.	Ob	Uplands	Same	2	1–3	Well drained
Oquaga channery loam, 20 to 30 percent slopes.	Oc	Uplands	Same	2	1–3	Well drained
Oquaga channery loam, 30 to 50 percent slopes.	Od	Uplands	Same	2	1–3	Well drained
Oquaga stony loam, 0 to 20 percent slopes.	Oe	Uplands	Same	1	0–3	Well drained
Oquaga stony loam, 20 to 30 percent slopes.	Of	Uplands	Same	1	0–3	Well drained
Oquaga stony loam, 30 to 60 percent slopes.	Og	Uplands	Same	1	0–3	Well drained
Papakating silt loam, 0 to 3 percent slopes.	Pa	Bottom lands	Recent alluvium of silt and some fine sand.	4+	3–10+	Very poorly drained
Peat and muck, undifferentiated, 0 to 3 percent slopes.	Pb	Bottom lands	Organic deposits	5+	1–10+	Very poorly drained
Red Hook silt loam, 0 to 3 percent slopes.	Ra	Terrace land	Water-worked sand, silt, and some gravel.	8+	5–30+	Poorly drained
Riverwash, 0 to 3 percent slopes	Rb	Stream channels	Gravel and sand from recent stream action.	Variable	Variable	
Scio fine sandy loam-silt loam, 0 to 3 percent slopes.	Sa	Stream terraces	Water-worked sand, silt, and some gravel.	8+	5–30+	Moderately well drained
Sweden loam, 0 to 12 percent slopes	Sb	Upland	Residuum and frost-worked materials from sandstone.	4	3–7	Well drained
Sweden stony loam, 0 to 12 percent slopes.	Sc	Upland	Same	4	3–7	Well drained
Tioga fine sandy loam, 0 to 3 percent slopes.	Ta	Bottom land	Stream deposited sand, silt, and gravel.	4+	3–10+	Well drained
Tioga fine sandy loam, high bottom phase, 0 to 3 percent slopes.	Tb	Bottom land	Same	4+	3–10+	Well drained
Tioga gravelly loam, 0 to 3 percent slopes.	Tc	Bottom land	Same	4+	3–10+	Well drained
Tunkhannock flaggy loam, 3 to 20 percent slopes.	Td	Stream fans	Same	6+	4–30+	Well drained
Tunkhannock flaggy loam, 20 to 30 percent slopes.	Te	Stream fans	Same	6	4–30	Well drained
Tunkhannock flaggy loam, 30 to 50 percent slopes.	Tf	Stream fans	Same	6	4–30	Well drained
Tunkhannock gravelly loam, 0 to 12 percent slopes.	Tg	Glaciofluvial terraces and stream fans.	Same	10+	6–30	Well drained

Summary of important characteristics—Continued

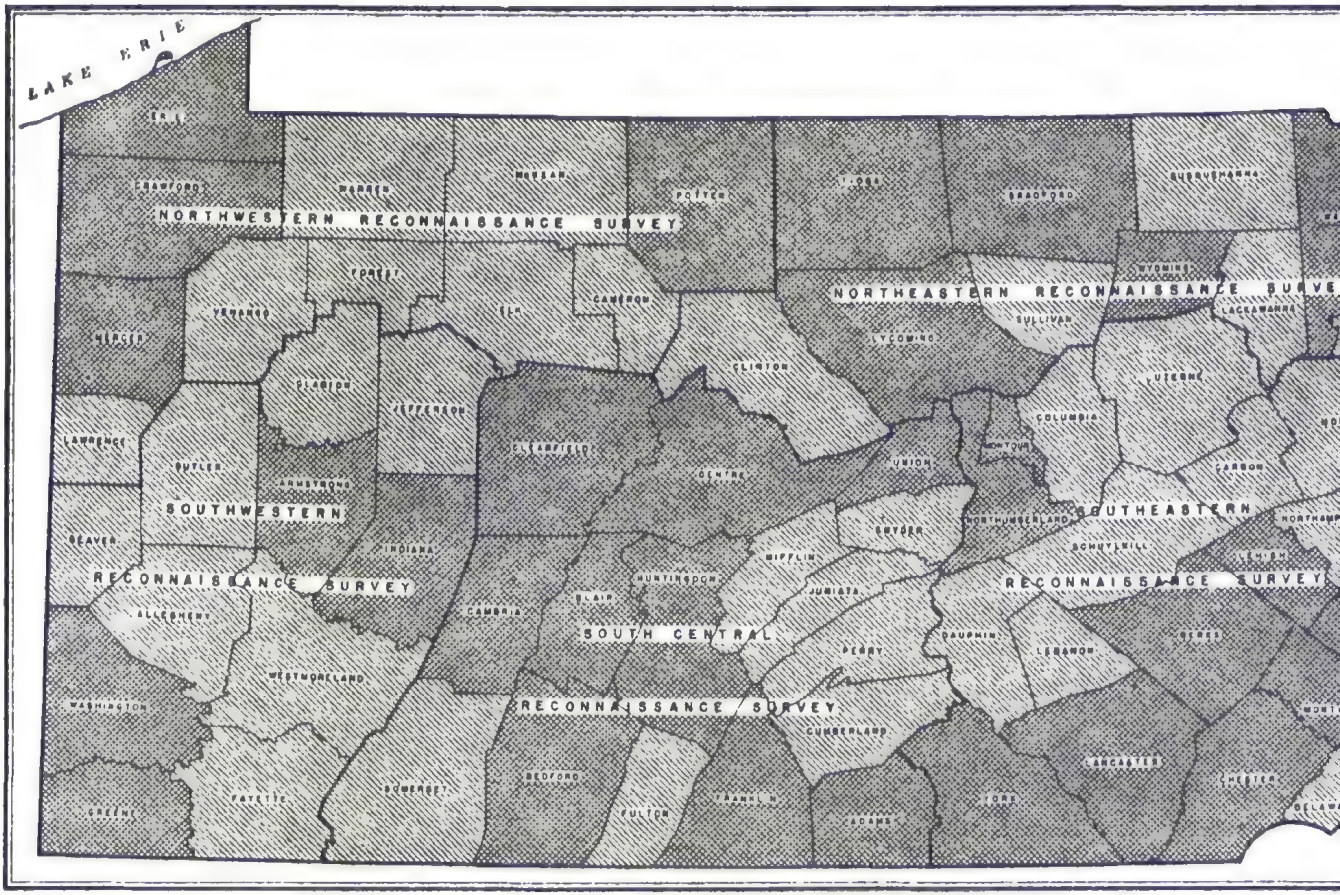
Reaction	Surface soil		Subsoil		
	Color	Consistency	Color	Texture	Permeability
Strongly acid	Same	Same	Same	Silt loam or clay loam.	Slow.
Strongly acid	Gray or dark brown	Friable	Mottled red, brown and yellow.	Silt loam or clay loam.	Slow.
Strongly acid	Same	Friable	Same	Silt loam or clay loam.	Slow.
Strongly acid	Same	Friable	Same	Silt loam or clay loam.	Slow.
Extremely acid	Light brownish gray or or pale gray.	Friable	Pale brown mottled with gray and yellow.	Silty clay loam	Slow.
Extremely acid	Very dark brown and light gray.	Loose	Same	Sandy loam	Slow.
Very strongly acid	Dark grayish brown	Friable	Pale brown mottled with gray.	Silt loam	Very slow.
Very strongly acid	Same	Friable	Same	Stony silt loam	Very slow.
Strongly acid	Brown	Very friable	Reddish brown	Stony or flaggy loam	Rapid.
Strongly acid	Brown	Very friable	Reddish brown	Loam	Rapid.
Strongly acid	Brown	Very friable	Reddish brown	Loam	Rapid.
Strongly acid	Brown	Very friable	Reddish brown	Loam	Rapid.
Strongly acid	Reddish brown or brown and pale brown and gray.	Very friable	Reddish brown	Stony or flaggy loam	Rapid.
Strongly acid	Same	Very friable	Reddish brown	Stony or flaggy loam	Rapid.
Strongly acid	Same	Very friable	Reddish brown	Stony or flaggy loam	Rapid.
Strongly acid	Black	Very friable	Mottled dark gray and pale yellow.	Silt loam	Very slow.
Strongly acid	Black	Very friable	Black and dark brown	Silty	Saturated.
Very strongly acid	Very dark gray	Very friable	Mottled dark gray and pale yellow.	Silt loam or silty clay	Slow.
Strongly acid	Dark grayish brown	Friable	Slightly mottled pale grayish brown and yellow.	Loam or silty clay loam.	Moderately slow.
Very strongly acid	Yellowish brown	Very friable	Reddish brown to yellowish red.	Channery loam or clay loam.	Moderately rapid.
Very strongly acid	Yellowish brown	Very friable	Same	Same	Moderately rapid.
Strongly acid	Brown	Very friable	Strong brown to yellowish brown.	Fine sandy loam	Rapid.
Strongly acid	Brown	Very friable	Same	Fine sandy loam	Rapid.
Strongly acid	Brown	Very friable	Same	Loamy sand and gravel.	Very rapid.
Very strongly acid	Light reddish brown and pinkish gray.	Loose	Brown or reddish brown	Flaggy loam	Very rapid.
Very strongly acid	Same	Loose	Same	Flaggy loam	Very rapid.
Very strongly acid	Same	Loose	Same	Flaggy loam	Very rapid.
Strongly acid	Brown	Very friable	Reddish yellow	Gravelly loam	Rapid.

Soils of Potter County, Pa.:

Soil	Map Symbol	Physiographic position	Parent material	Depth of soil to bedrock		Internal drainage
				Average	Range	
				Feet	*Feet*	
Tunkhannock gravelly loam, 12 to 20 percent slopes.	Th	Same	Same	10+	6–30+	Well drained
Unadilla fine sandy loam, 0 to 3 percent slopes.	Ua	Stream terraces	Stream-worked silt, sand, and some gravel.	6+	5–20	Well drained
Unadilla silt loam, 0 to 3 percent slopes.	Ub	Stream terraces	Same	6+	5–20	Well drained
Volusia channery silt loam, 0 to 3 percent slopes.	Va	Uplands	Compact, fine-textured glacial till.	6	5–15	Poorly drained
Volusia channery silt loam, 3 to 8 percent slopes.	Vb	Uplands	Same	6	5–15	Poorly drained
Volusia channery silt loam, 8 to 15 percent slopes.	Vc	Uplands	Same	6	5–15	Poorly drained
Volusia channery silt loam, 15 to 25 percent slopes.	Vd	Uplands	Same	6	5–15	Poorly drained
Volusia channery silt loam, 25 to 40 percent slopes.	Ve	Uplands	Same	6	5–15	Poorly drained
Volusia flaggy silt loam, 0 to 8 percent slopes.	Vf	Uplands	Compact, fine-textured glacial till with many sandstone fragments.	5	4–12	Poorly drained
Volusia flaggy silt loam, 8 to 15 percent slopes.	Vg	Uplands	Same	5	4–12	Poorly drained
Volusia flaggy silt loam, 15 to 25 percent slopes.	Vh	Uplands	Same	5	4–12	Poorly drained
Vrooman fine sandy loam, 0 to 3 percent slopes.	Vk	Stream terraces	Stream-worked reddish silt, sand, and gravel.	8	6–20	Well drained
Vrooman silt loam, 0 to 3 percent slopes	Vm	Stream terraces	Same	8+	6–20+	Well drained
Wellsboro channery silt loam, 0 to 8 percent slopes.	Wa	Uplands	Compact reddish glacial till and frost-worked material.	6+	4–20+	Moderately well drained
Wellsboro channery silt loam, 8 to 15 percent slopes.	Wb	Uplands	Same	6+	4–20+	Moderately well drained
Wellsboro channery silt loam, 15 to 25 percent slopes.	Wc	Uplands	Same	6+	4–20+	Moderately well drained
Wellsboro channery silt loam, 25 to 35 percent slopes.	Wd	Uplands	Same	6	4–20	Moderately well drained
Wellsboro stony loam, 0 to 15 percent slopes.	We	Uplands	Same	6+	4–20+	Moderately well drained
Wellsboro stony loam, 15 to 25 percent slopes.	Wf	Uplands	Same	6+	4–20+	Moderately well drained
Wellsboro stony loam, 25 to 35 percent slopes.	Wg	Uplands	Same	6	4–20	Moderately well drained
Wharton channery silt loam, 0 to 12 percent slopes.	Wh	Uplands	Residuum from yellow and brown shale and siltstone.	3	2–6	Moderately well drained
Wharton channery silt loam, 12 to 20 percent slopes.	Wk	Uplands	Same	3	2–6	Moderately well drained
Wharton channery silt loam, 20 to 30 percent slopes.	Wm	Uplands	Same	3	2–6	Moderately well drained
Woostern gravelly loam, 0 to 12 percent slopes.	Wn	Uplands	Yellowish brown sand and gravelly glacial till.	10+	6–40+	Well drained
Woostern gravelly loam, 12 to 20 percent slopes.	Wo	Uplands	Same	10+	6–40+	Well drained
Woostern gravelly loam, 20 to 30 percent slopes.	Wp	Uplands	Same	10	6–40	Well drained
Woostern gravelly loam, 30 to 50 percent slopes.	Wr	Uplands	Same	10	6–40	Well drained

Summary of important characteristics—Continued

Reaction	Surface soil		Subsoil		
	Color	Consistency	Color	Texture	Permeability
Strongly acid	Brown	Very friable	Reddish yellow	Gravelly loam	Rapid.
Very strongly acid	Dark brown	Very friable	Yellowish brown	Fine sandy loam	Rapid.
Very strongly acid	Dark brown	Very friable	Yellowish brown	Silt loam	Moderately rapid.
Strongly acid	Dark gray	Friable	Mottled yellow and gray.	Silty clay loam	Slow.
Strongly acid	Dark gray	Friable	Same	Silty clay loam	Slow.
Strongly acid	Dark gray	Friable	Same	Silty clay loam	Slow.
Strongly acid	Dark gray	Friable	Same	Silty clay loam	Slow.
Strongly acid	Dark gray	Friable	Same	Silty clay loam	Slow.
Strongly acid	Dark gray	Friable	Same	Flaggy silty clay loam.	Slow.
Strongly acid	Dark gray	Friable	Same	Flaggy silty clay loam.	Slow.
Strongly acid	Dark gray	Friable	Same	Flaggy silty clay loam.	Slow.
Strongly acid	Dark brown or brownish red.	Very friable	Brownish red	Fine sandy loam	Rapid.
Strongly acid	Same	Very friable	Brownish red	Fine sandy loam	Moderately rapid.
Strongly acid	Dark reddish gray or red.	Very friable	Weak red mottled with reddish brown.	Silt loam to clay loam.	Moderately slow.
Strongly acid	Same	Very friable	Same	Silt loam to clay loam.	Moderately slow.
Strongly acid	Same	Very friable	Same	Silt loam to clay loam.	Moderately slow.
Strongly acid	Same	Very friable	Same	Silt loam to clay loam.	Moderately slow.
Very strongly acid	Very dark brown	Friable	Mottled purplish and yellowish red.	Loam or clay loam	Moderate.
Very strongly acid	Very dark brown	Friable	Same	Loam or clay loam	Moderate.
Very strongly acid	Very dark brown	Friable	Same	Loam or clay loam	Moderate.
Extremely acid	Light grayish brown	Friable	Light yellowish brown	Silty clay or clay loam.	Moderately slow.
Extremely acid	Same	Friable	Same	Silty clay or clay loam.	Moderately slow.
Extremely acid	Same	Friable	Same	Silty clay or clay loam.	Moderately slow.
Extremely acid	Dark grayish brown	Loose	Very dark brown and yellowish brown.	Gravelly loam	Very rapid.
Extremely acid	Same	Loose	Same	Gravelly loam	Very rapid.
Extremely acid	Same	Loose	Same	Gravelly loam	Very rapid.
Extremely acid	Same	Loose	Same	Gravelly loam	Very rapid.



Areas surveyed in Pennsylvania: Reconnaissance surveys shown by northwest-southeast hatching; crosshatching indicates both detailed and reconnaissance surveys.

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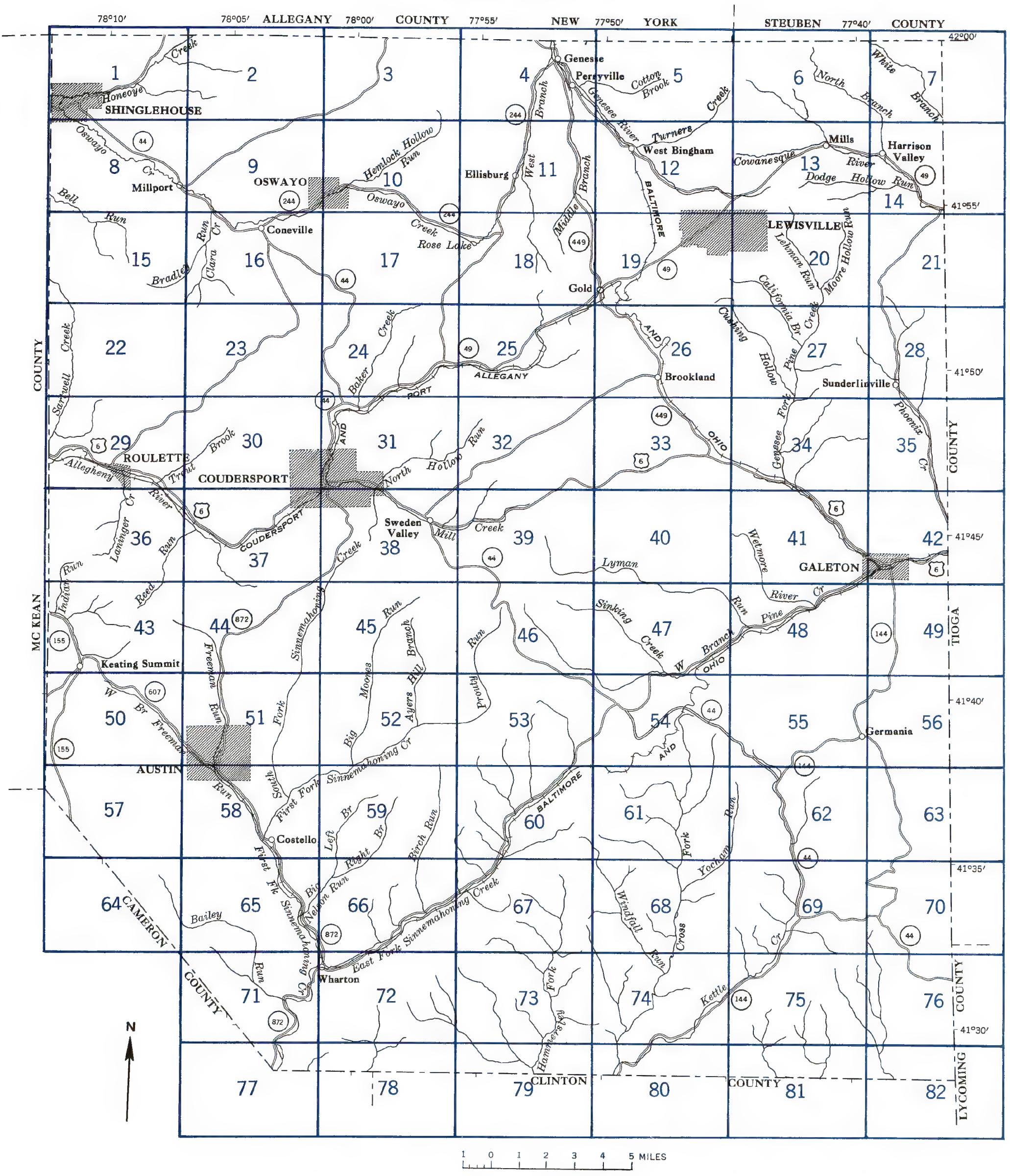


POTTER COUNTY, PENNSYLVANIA

COLOR GROUPING

DEEP AND VERY DEEP, WELL DRAINED, MEDIUM TO MODERATELY COARSE TEXTURED, LEVEL TO SLOPING SOILS OF THE UPLANDS AND TERRACES

- Bg Bath channery silt loam, 0-12 percent slopes
- Ca Cattaraugus channery loam, 0-12 percent slopes
- Cu Chenango gravelly loam, 0-12 percent slopes
- **C2a** Clymer channery loam, 0-12 percent slopes
- Ga Germania silt loam, 0-12 percent slopes
- La Lackawanna channery loam, 0-12 percent slopes
- Le Lackawanna channery silt loam, 0-12 percent slopes
- Lk Lackawanna channery silt loam, 25-40" deep, residual variant, 0-12 percent slopes
- L2e Lordstown channery silt loam, neutral variant, 0-30 percent slopes
- **Sb** Sweden loam, 0-12 percent slopes
- Tg Tunkhannock gravelly loam, 0-12 percent slopes
- Ua Unadilla fine sandy loam, 0-3 percent slopes
- Ub Unadilla silt loam, 0-3 percent slopes
- Vk Vrooman fine sandy loam, 0-3 percent slopes
- Vm Vrooman silt loam, 0-3 percent slopes
- Wn Woostern gravelly loam, 0-12 percent slopes

DEEP AND MODERATELY DEEP, WELL AND SOMEWHAT EXCESSIVELY DRAINED, MODERATELY COARSE TEXTURED, LEVEL TO SLOPING SOILS OF THE UPLANDS

- Dd Dekalb channery loam, 40 or more inches deep, 0-12 percent slopes
- Dh Dekalb fine sandy loam, 0-12 percent slopes
- Ds Dilldown sandy loam, 0-12 percent slopes

DEEP AND MODERATELY DEEP, MODERATELY WELL DRAINED, MEDIUM-TEXTURED, LEVEL TO SLOPING SOILS OF THE UPLANDS AND TERRACES

- Bn Braceville gravelly silt loam, 0-5 percent slopes
- **C2f** Cookport channery loam, 0-8 percent slopes
- C2o Culvers channery silt loam, 0-8 percent slopes
- Ma Mardin channery silt loam, 0-8 percent slopes
- **Sa** Scio fine sandy loam-silt loam, 0-3 percent slopes
- Wa Wellsboro channery silt loam, 0-8 percent slopes
- Wh Wharton channery silt loam, 0-12 percent slopes

DEEP, WELL AND MODERATELY WELL DRAINED, MEDIUM TO MODERATELY COARSE TEXTURED SOILS OF THE BOTTOM LANDS

- Ba Barbour fine sandy loam, 0-3 percent slopes
- Bb Barbour fine sandy loam, high-bottom phase, 0-3 percent slopes
- Bc Barbour gravelly fine sandy loam, 0-3 percent slopes
- Bd Basher sandy loam, 0-3 percent slopes
- Be Basher silt loam, 0-3 percent slopes
- Bf Basher silt loam, high-bottom phase, 0-3 percent slopes
- Me Middlebury sandy loam, 0-3 percent slopes
- Mf Middlebury silt loam, 0-3 percent slopes
- Mg Middlebury silt loam, high-bottom phase, 0-3 percent slopes
- Ta Tioga fine sandy loam, 0-3 percent slopes
- Tb Tioga fine sandy loam, high-bottom phase, 0-3 percent slopes
- Tc Tioga gravelly loam, 0-3 percent slopes

DEEP AND VERY DEEP, WELL DRAINED, MEDIUM-TEXTURED, MODERATELY SLOPING SOILS OF THE UPLANDS AND TERRACES

- Bh Bath channery silt loam, 12-20 percent slopes
- Cb Cattaraugus channery loam, 12-20 percent slopes
- Cv Chenango gravelly loam, 12-20 percent slopes
- **C2b** Clymer channery loam, 12-20 percent slopes
- Gb Germania silt loam, 12-20 percent slopes
- Lb Lackawanna channery loam, 12-20 percent slopes
- Lf Lackawanna channery silt loam, 12-20 percent slopes
- Lm Lackawanna channery silt loam, 25-40" deep, residual variant, 12-20 percent slopes
- Th Tunkhannock gravelly loam, 12-20 percent slopes
- Wo Woostern gravelly loam, 12-20 percent slopes

DEEP AND MODERATELY DEEP, MODERATELY WELL DRAINED, MEDIUM-TEXTURED, SLOPING SOILS OF THE UPLANDS

- **C2g** Cookport channery loam, 8-15 percent slopes
- C2p Culvers channery silt loam, 8-15 percent slopes
- Mb Mardin channery silt loam, 8-15 percent slopes
- Wb Wellsboro channery silt loam, 8-15 percent slopes
- Wk Wharton channery silt loam, 12-20 percent slopes

SHALLOW TO VERY SHALLOW, WELL AND SOMEWHAT EXCESSIVELY DRAINED, MEDIUM TO MODERATELY COARSE TEXTURED, GENTLY SLOPING TO STRONGLY SLOPING SOILS OF THE UPLANDS

- Da Dekalb channery loam, 10-25" deep, 0-12 percent slopes
- Db Dekalb channery loam, 10-25" deep, 12-20 percent slopes
- De Dekalb channery loam, 40 or more inches deep, 12-20 percent slopes
- Dk Dekalb fine sandy loam, 12-20 percent slopes
- Dt Dilldown sandy loam, 12-30 percent slopes
- L2a Lordstown channery silt loam, 0-12 percent slopes
- L2b Lordstown channery silt loam, 12-20 percent slopes
- Mh Minora silt loam, 0-12 percent slopes
- Mk Minora silt loam, 12-20 percent slopes
- Oa Oquaga channery loam, 0-12 percent slopes
- Ob Oquaga channery loam, 12-20 percent slopes

SHALLOW AND DEEP, POORLY AND VERY POORLY DRAINED, MEDIUM-TEXTURED, LEVEL TO STRONGLY SLOPING SOILS OF THE UPLANDS

- Bo Brinkerton and Armagh silt loams, 0-15 percent slopes
- Ck Cavode channery silt loam, 0-8 percent slopes
- Cm Cavode channery silt loam, 8-15 percent slopes
- Co Cavode silt loam, 0-8 percent slopes
- Cp Cavode silt loam, 8-15 percent slopes
- Cx Chippewa silt loam, 0-8 percent slopes
- Mo Morris silt loam, 0-3 percent slopes
- Mp Morris silt loam, 3-8 percent slopes
- Mr Morris silt loam, 8-15 percent slopes
- Na Nolo channery silt loam, 0-8 percent slopes
- Nc Norwich silt loam, 0-15 percent slopes
- Va Volusia channery silt loam, 0-3 percent slopes
- Vb Volusia channery silt loam, 3-8 percent slopes
- Vc Volusia channery silt loam, 8-15 percent slopes
- Vf Volusia flaggy silt loam, 0-8 percent slopes
- Vg Volusia flaggy silt loam, 8-15 percent slopes

MODERATELY DEEP AND DEEP, POORLY AND VERY POORLY DRAINED, MEDIUM-TEXTURED, NEARLY LEVEL SOILS OF THE BOTTOM LANDS AND TERRACES

- Ha Holly sandy loam, 0-3 percent slopes
- Hb Holly silt loam, 0-3 percent slopes
- Mn Mixed alluvium, 0-5 percent slopes
- Pa Papakating silt loam, 0-3 percent slopes
- Pb Peat and muck, undifferentiated, 0-3 percent slopes
- Ra Red Hook silt loam, 0-3 percent slopes

MODERATELY SHALLOW TO DEEP, POORLY AND VERY POORLY DRAINED, LEVEL TO STRONGLY SLOPING SOILS OF THE UPLANDS

- Cn Cavode channery silt loam, 15-25 percent slopes
- Cr Cavode silt loam, 15-25 percent slopes
- Cs Cavode stony silt loam, 0-15 percent slopes
- Cy Chippewa stony silt loam, 0-8 percent slopes
- Ms Morris silt loam, 15-25 percent slopes
- Mu Morris stony silt loam, 0-15 percent slopes
- Mv Morris stony silt loam, 15-25 percent slopes
- Nb Nolo stony sandy loam, sandy variant, 0-12 percent slopes
- Nd Norwich stony silt loam, 0-15 percent slopes
- Vd Volusia channery silt loam, 15-25 percent slopes
- Vh Volusia flaggy silt loam, 15-25 percent slopes

MODERATELY STEEP, MEDIUM TO MODERATELY COARSE TEXTURED, STONE FREE AND STONE CLEARED SOILS OF THE UPLANDS AND TERRACES

- Bk Bath channery silt loam, 20-30 percent slopes
- Cc Cattaraugus channery loam, 20-30 percent slopes
- Cw Chenango gravelly loam, 20-50 percent slopes
- **C2c** Clymer channery loam, 20-30 percent slopes
- **C2h** Cookport channery loam, 15-25 percent slopes
- C2r Culvers channery silt loam, 15-25 percent slopes
- Dc Dekalb channery loam, 10-25" deep, 20-30 percent slopes
- Df Dekalb channery loam, 40 or more inches deep, 20-30 percent slopes
- Dm Dekalb fine sandy loam, 20-30 percent slopes
- Gc Germania silt loam, 20-30 percent slopes
- Lc Lackawanna channery loam, 20-30 percent slopes
- Lg Lackawanna channery silt loam, 20-30 percent slopes
- Ln Lackawanna channery silt loam, 25-40" deep, residual variant, 20-30 percent slopes
- L2c Lordstown channery silt loam, 20-30 percent slopes
- Mc Mardin channery silt loam, 15-25 percent slopes
- Mm Minora silt loam, 20-30 percent slopes
- Oc Oquaga channery loam, 20-30 percent slopes
- Te Tunkhannock flaggy loam, 20-30 percent slopes
- Wc Wellsboro channery silt loam, 15-25 percent slopes
- Wm Wharton channery silt loam, 20-30 percent slopes
- Wp Woostern gravelly loam, 20-30 percent slopes

DEEP OR SHALLOW, LEVEL TO STRONGLY SLOPING, MEDIUM TO MODERATELY COARSE TEXTURED, SOMEWHAT EXCESSIVELY TO MODERATELY WELL DRAINED, STONY OR FLOGGY SOILS OF THE UPLANDS AND TERRACES

- Ce Cattaraugus stony loam, 0-20 percent slopes
- C2d Clymer stony loam, 0-20 percent slopes
- C2k Cookport stony loam, 0-15 percent slopes
- C2t Culvers stony silt loam, 0-15 percent slopes
- Dn Dekalb stony loam, 10-25" deep, 0-20 percent slopes
- Dp Dekalb stony loam, 40 or more inches deep, 0-20 percent slopes
- Lo Lackawanna stony loam, 0-20 percent slopes
- Ls Leetonia stony loamy sand, 0-20 percent slopes
- L2f Lordstown stony loam, 0-20 percent slopes
- Oe Oquaga stony loam, 0-20 percent slopes
- Sc Sweden stony loam, 0-12 percent slopes
- Td Tunkhannock flaggy loam, 3-20 percent slopes
- We Wellsboro stony loam, 0-15 percent slopes

SHALLOW TO DEEP, MODERATELY STEEP OR STEEP, SOMEWHAT EXCESSIVELY TO MODERATELY WELL DRAINED, SOILS OF THE UPLANDS

- Bm Bath channery silt loam, 30-40 percent slopes
- Cd Cattaraugus channery loam, 30-40 percent slopes
- Cf Cattaraugus stony loam, 20-30 percent slopes
- **C2e** Clymer stony loam, 20-30 percent slopes
- **C2m** Cookport stony loam, 15-25 percent slopes
- **C2n** Cookport stony loam, 25-50 percent slopes
- C2s Culvers channery silt loam, 25-35 percent slopes
- C2u Culvers stony silt loam, 15-25 percent slopes
- C2v Culvers stony silt loam, 25-35 percent slopes
- Dg Dekalb channery loam, 40 or more inches deep, 30-40 percent slopes
- Do Dekalb stony loam, 10-25" deep, 20-30 percent slopes
- Dr Dekalb stony loam, 40 or more inches deep, 20-30 percent slopes
- Gd Germania silt loam, 30-50 percent slopes
- Ld Lackawanna channery loam, 30-40 percent slopes
- Lh Lackawanna channery silt loam, 30-40 percent slopes
- Lp Lackawanna stony loam, 20-30 percent slopes
- Lt Leetonia stony loamy sand, 20-30 percent slopes
- L2d Lordstown channery silt loam, 30-40 percent slopes
- L2g Lordstown stony loam, 20-30 percent slopes
- Md Mardin channery silt loam, 25-35 percent slopes
- Of Oquaga stony loam, 20-30 percent slopes
- Wd Wellsboro channery silt loam, 25-35 percent slopes
- Wf Wellsboro stony loam, 15-25 percent slopes
- Wg Wellsboro stony loam, 25-35 percent slopes
- Wr Woostern gravelly loam, 30-50 percent slopes

SHALLOW TO DEEP, VERY STEEP SOILS OF THE UPLANDS AND TERRACES

- Bp Brinkerton and Armagh silt loams, 15-50 percent slopes
- Cg Cattaraugus and Lackawanna channery loams, 40-60 percent slopes
- Ch Cattaraugus and Lackawanna stony loams, 30-60 percent slopes
- Ct Cavode stony silt loam, 15-50 percent slopes
- C2w Culvers and Wellsboro channery silt loams, 35-50 percent slopes
- Lr Leetonia channery loamy sand and Dekalb channery loam, 30-60 percent slopes
- Lu Leetonia and Dekalb very stony soils, 0-20 percent slopes
- Lv Leetonia and Dekalb very stony soils, 20-30 percent slopes
- Lw Leetonia and Dekalb very stony soils, 30-70 percent slopes
- L2h Lordstown and Bath channery silt loams, 40-60 percent slopes
- Mt Morris silt loam, 25-50 percent slopes
- Mw Morris stony silt loam, 25-50 percent slopes
- Od Oquaga channery loam, 30-50 percent slopes
- Og Oquaga stony loam, 30-60 percent slopes
- Tf Tunkhannock flaggy loam, 30-50 percent slopes
- Ve Volusia channery silt loam, 25-40 percent slopes

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

POTTER COUNTY, PENNSYLVANIA

PENNSYLVANIA STATE UNIVERSITY
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION

SOILS LEGEND

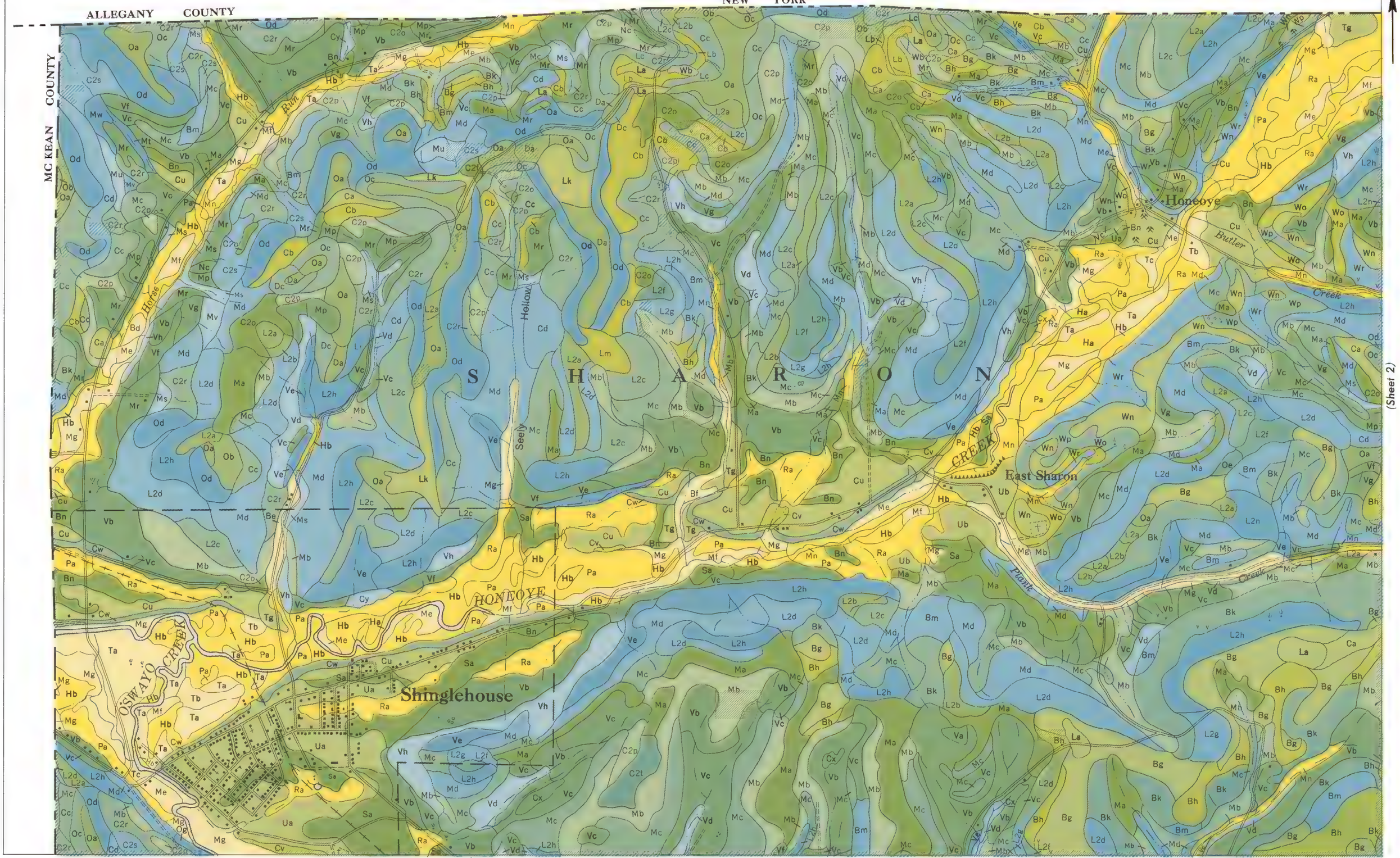
SYMBOL	NAME
Ba	Barbour fine sandy loam, 0-3 percent slopes
Bb	Barbour fine sandy loam, high-bottom phase, 0-3 percent slopes
Bc	Barbour gravelly fine sandy loam, 0-3 percent slopes
Bd	Basher sandy loam, 0-3 percent slopes
Be	Basher si t loam, 0-3 percent slopes
Bf	Basher silt loam, high-bottom phase, 0-3 percent slopes
Bg	Bath channery silt loam, 0-12 percent slopes
Bh	Bath channery silt loam, 12-20 percent slopes
Bk	Bath channery silt loam, 20-30 percent slopes
Bm	Bath channery silt loam, 30-40 percent slopes
Bn	Braceville gravel y silt loam, 0-5 percent slopes
Bo	Brinkerton and Armagh si t loams, 0-15 percent slopes
Bp	Brinkerton and Armagh silt loams, 15-50 percent slopes
Ca	Cattaraugus channery loam, 0-12 percent slopes
Cb	Cattaraugus channery loam, 12-20 percent slopes
Cc	Cattaraugus channery .oam, 20-30 percent slopes
Cd	Cattaraugus channery loam, 30-40 percent slopes
Ce	Cattaraugus stony loam, 0-20 percent slopes
Cf	Cattaraugus stony loam, 20-30 percent slopes
Cg	Cattaraugus and Lackawanna channery loams, 40-60 percent slopes
Ch	Cattaraugus and Lackawanna stony loams, 30-60 percent slopes
Ck	Cavode channery silt loam, 0-8 percent slopes
Cm	Cavode channery silt loam, 8-15 percent slopes
Cn	Cavode channery silt loam, 15-25 percent slopes
Co	Cavode s'lt loam, 0-8 percent slopes
Cp	Cavode silt loam, 8-15 percent slopes
Cr	Cavode silt loam, 15-25 percent slopes
Cs	Cavode stony silt loam, 0-15 percent slopes
Ct	Cavode stony silt loam, 15-50 percent slopes
Cu	Chenango gravelly loam, 0-12 percent slopes
Cv	Chenango gravelly loam, 12-20 percent slopes
Cw	Chenango gravelly loam, 20-50 percent slopes
Cx	Chippewa silt loam, 0-8 percent slopes
Cy	Chippewa stony silt loam, 0-8 percent slopes
C2a	Clymer channery loam, 0-12 percent slopes
C2b	Clymer channery loam, 12-20 percent slopes
C2c	Clymer channery loam, 20-30 percent slopes
C2d	Clymer stony loam, 0-20 percent slopes
C2e	Clymer stony loam, 20-30 percent slopes
C2f	Cookport channery loam, 0-8 percent slopes
C2g	Cookport channery loam, 8-15 percent slopes
C2h	Cookport channery loam, 15-25 percent slopes
C2k	Cookport stony loam, 0-15 percent slopes
C2m	Cookport stony loam, 15-25 percent slopes
C2n	Cookport stony loam, 25-50 percent slopes
C2o	Culvers channery silt loam, 0-8 percent slopes
C2p	Culvers channery silt loam, 8-15 percent slopes
C2r	Culvers channery silt loam, 15-25 percent slopes
C2s	Culvers channery silt loam, 25-35 percent slopes
C2t	Culvers stony silt loam, 0-15 percent slopes
C2u	Culvers stony silt loam, 15 25 percent slopes
C2v	Culvers stony silt loam, 25-35 percent slopes
C2w	Culvers and Wellsboro channery silt loams, 35-50 percent slopes
Da	Dekalb channery loam, 10-25" deep, 0-12 percent slopes
Db	Dekalb channery loam, 10-25" deep, 12-20 percent slopes
Dc	Dekalb channery loam, 10-25" deep, 20-30 percent slopes
Dd	Dekalb channery loam, 40 or more inches deep, 0-12 percent slopes
De	Dekalb channery loam, 40 or more inches deep, 12-20 percent slopes
Df	Dekalb channery oam, 40 or more inches deep, 20-30 percent slopes
Dg	Dekalb channery oam, 40 or more inches deep, 30-40 percent slopes
Dh	Dekalb fine sandy loam, 0-12 percent slopes
Dk	Dekalb fine sandy loam, 12-20 percent slopes
Dm	Dekalb fine sandy loam, 20-30 percent slopes
Dn	Dekalb stony loam, 10-25" deep, 0-20 percent slopes
Do	Dekalb stony loam, 10-25" deep, 20-30 percent slopes
Dp	Dekalb stony loam, 40 or more inches deep, 0-20 percent slopes
Dr	Dekalb stony loam, 40 or more inches deep, 20 30 percent slopes
Ds	Dilldown sandy loam, 0-12 percent slopes
Dt	Dilldown sandy loam, 12-30 percent slopes

SYMBOL	NAME
Ga	Germania silt loam, 0-12 percent slopes
Gb	Germania silt loam, 12-20 percent slopes
Gc	Germania silt loam, 20-30 percent slopes
Gd	Germania silt loam, 30-50 percent slopes
Ha	Holly sandy loam, 0-3 percent slopes
Hb	Holly silt loam, 0-3 percent slopes
La	Lackawanna channery loam, 0-12 percent slopes
Lb	Lackawanna channery loam, 12-20 percent s opes
Lc	Lackawanna channery loam, 20-30 percent slopes
Ld	Lackawanna channery loam, 30-40 percent slopes
Le	Lackawanna channery silt loam, 0-12 percent slopes
Lf	Lackawanna channery silt loam, 12-20 percent slopes
Lg	Lackawanna channery silt loam, 20-30 percent slopes
Lh	Lackawanna channery silt loam, 30-40 percent slopes
Lk	Lackawanna channery s lt loam, 25-40" deep, residual variant, 0-12 percent slopes
Lm	Lackawanna channery silt loam, 25-40" deep, residual variant, 12-20 percent slopes
Ln	Lackawanna channery silt loam, 25-40" deep, residual variant, 20-30 percent slopes
Lo	Lackawanna stony loam, 0-20 percent slopes
Lp	Lackawanna stony loam, 20-30 percent slopes
Lr	Leetonia channery loamy sand and Dekalb channery loam, 30-60 percent slopes
Ls	Leetonia stony loamy sand, 0-20 percent slopes
Lt	Leetonia stony loamy sand, 20-30 percent slopes
Lu	Leeton a and Dekalb very stony soils, 0-20 percent slopes
Lv	Leetonia and Dekalb very stony soils, 20-30 percent slopes
Lw	Leetonia and Dekalb very stony soils, 30-70 percent slopes
L2a	Lordstown channery silt loam, 0-12 percent slopes
L2b	Lordstown channery silt loam, 12-20 percent slopes
L2c	Lordstown channery silt .oam, 20-30 percent slopes
L2d	Lordstown channery silt loam, 30-40 percent slopes
L2e	Lordstown channery silt loam, neutral variant, 0-30 percent slopes
L2f	Lordstown stony loam, 0-20 percent slopes
L2g	Lordstown stony loam, 20-30 percent slopes
L2h	Lordstown and Bath channery silt loams, 40-60 percent slopes
Ma	Mardin channery silt loam, 0-8 percent slopes
Mb	Mardin channery silt loam, 8-15 percent slopes
Mc	Mardin channery silt loam, 15-25 percent slopes
Md	Mardin channery s lt loam, 25-35 percent slopes
Me	Middlebury sandy loam, 0-3 percent slopes
Mf	Middlebury silt loam, 0-3 percent slopes
Mg	Middlebury silt loam, h'gh-bottom phase, 0-3 percent slopes
Mh	Minora silt loam, 0-12 percent slopes
Mk	Minora silt loam, 12-20 percent slopes
Mm	Minora silt loam, 20-30 percent slopes
Mn	Mixed alluvium, 0-5 percent slopes
Mo	Morris silt loam, 0-3 percent slopes
Mp	Morris silt loam, 3-8 percent slopes
Mr	Morris silt loam, 8-15 percent slopes
Ms	Morris silt loam, 15-25 percent slopes
Mt	Morris silt loam, 25-50 percent slopes
Mu	Morris stony silt loam, 0-15 percent slopes
Mv	Morris stony silt loam, 15-25 percent slopes
Mw	Morris stony silt loam, 25-50 percent slopes
Na	Nolo channery silt loam, 0-8 percent slopes
Nb	Nolo stony sandy loam, sandy variant, 0-12 percent slopes
Nc	Norwich silt loam, 0-15 percent slopes
Nd	Norwich stony silt loam, 0-15 percent slopes
Oa	Oquaga channery loam, 0-12 percent slopes
Ob	Oquaga channery loam, 12-20 percent slopes
Oc	Oquaga channery loam, 20-30 percent slopes
Od	Oquaga channery loam, 30-50 percent slopes
Oe	Oquaga stony loam, 0-20 percent slopes
Of	Oquaga stony loam, 20-30 percent slopes
Og	Oquaga stony loam, 30-60 percent slopes

SYMBOL	NAME
Pa	Papakating silt loam, 0-3 percent slopes
Pb	Peat and muck, undifferentiated, 0-3 percent slopes
Ra	Red Hook silt loam, 0-3 percent slopes
Rb	Riverwash, 0-3 percent slopes
Sa	Scio fine sandy loam-silt loam, 0-3 percent slopes
Sb	Sweden loam, 0-12 percent slopes
Sc	Sweden stony loam, 0-12 percent slopes
Ta	Tioga fine sandy loam, 0-3 percent slopes
Tb	Tioga fine sandy loam, high-bottom phase, 0-3 percent slopes
Tc	Tioga gravelly loam, 0-3 percent slopes
Td	Tunkhannock flaggy loam, 3-20 percent s opes
Te	Tunkhannock flaggy loam, 20-30 percent slopes
Tf	Tunkhannock flaggy loam, 30-50 percent slopes
Tg	Tunkhannock gravelly loam, 0-12 percent slopes
Th	Tunkhannock gravelly loam, 12-20 percent slopes
Ua	Unadilla fine sandy loam, 0-3 percent slopes
Ub	Unadilla silt loam, 0-3 percent slopes
Va	Volusia channery silt loam, 0-3 percent slopes
Vb	Volusia channery silt loam, 3-8 percent slopes
Vc	Volusia channery silt loam, 8-15 percent slopes
Vd	Volusia channery silt loam, 15-25 percent slopes
Ve	Volusia channery silt loam, 25-40 percent slopes
Vf	Volusia flaggy silt loam, 0-8 percent slopes
Vg	Volusia flaggy silt loam, 8-15 percent slopes
Vh	Volusia flaggy silt loam, 15-25 percent slopes
Vk	Vrooman fine sandy loam, 0-3 percent slopes
Vm	Vrooman silt loam, 0-3 percent slopes
Wa	Wellsboro channery silt loam, 0-8 percent slopes
Wb	Wellsboro channery silt loam, 8-15 percent slopes
Wc	Wellsboro channery silt loam, 15-25 percent slopes
Wd	Wellsboro channery silt loam, 25-35 percent s opes
We	Wellsboro stony loam, 0-15 percent slopes
Wf	Wellsboro stony loam, 15-25 percent slopes
Wg	Wellsboro stony loam, 25-35 percent slopes
Wh	Wharton channery silt loam, 0-12 percent slopes
Wk	Wharton channery silt loam, 12-20 percent s opes
Wm	Wharton channery silt loam, 20-30 percent slopes
Wn	Woostern gravelly loam, 0-12 percent slopes
Wo	Woostern grave ly loam, 12-20 percent slopes
Wp	Woostern gravelly loam, 20-30 percent slopes
Wr	Woostern gravelly loam, 30-50 percent slopes

Soils surveyed 1946-53 by K. V. Goodman, John C. F. Tedrow, and R. W. Stem, U. S. Department of Agriculture, and Leonard G. Yearick, Pennsylvania State University.
Correlation by W. H. Lyford, U. S. Department of Agriculture.

Soil map constructed by Cartographic Division, Soil Conservation Service, USDA, from 1952 aerial photographs. Map based on polyconic projection, 1927 North American datum.


ALLEGANY COUNTY
NEW YORK
MC KEAN COUNTY
SHARON
Honeoye
East Sharon
Shinglehouse
HONEOYE
Horse Run
Hellaw
Seely
Butler Creek
CREEK
Plank Creek
OSWAYO CREEK
N
(Sheet 2)
(Sheet 8)
0
1/2
1 Mile
Scale 1:20 000
0
5000 Feet

POTTER COUNTY, PENNSYLVANIA

N

ALLEGANY COUNTY

NEW YORK

S H A R O N

O S W A Y O

Kibbeville

Crystal

Butler Creek

Mt Plank

Hollow

Stevenmile Creek

(Sheet 1)

(Sheet 3)

(Sheet 9)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

N

ALLEGANY COUNTY

NEW YORK

(Sheet 2)

(Sheet 4)

Dutton Hollow

Eleven Mile Creek

Eleven Mile

Beebe Creek

Orebed Creek

Kinney Corners

McGinnis Hollow

O S W A Y O

G E N E S E E

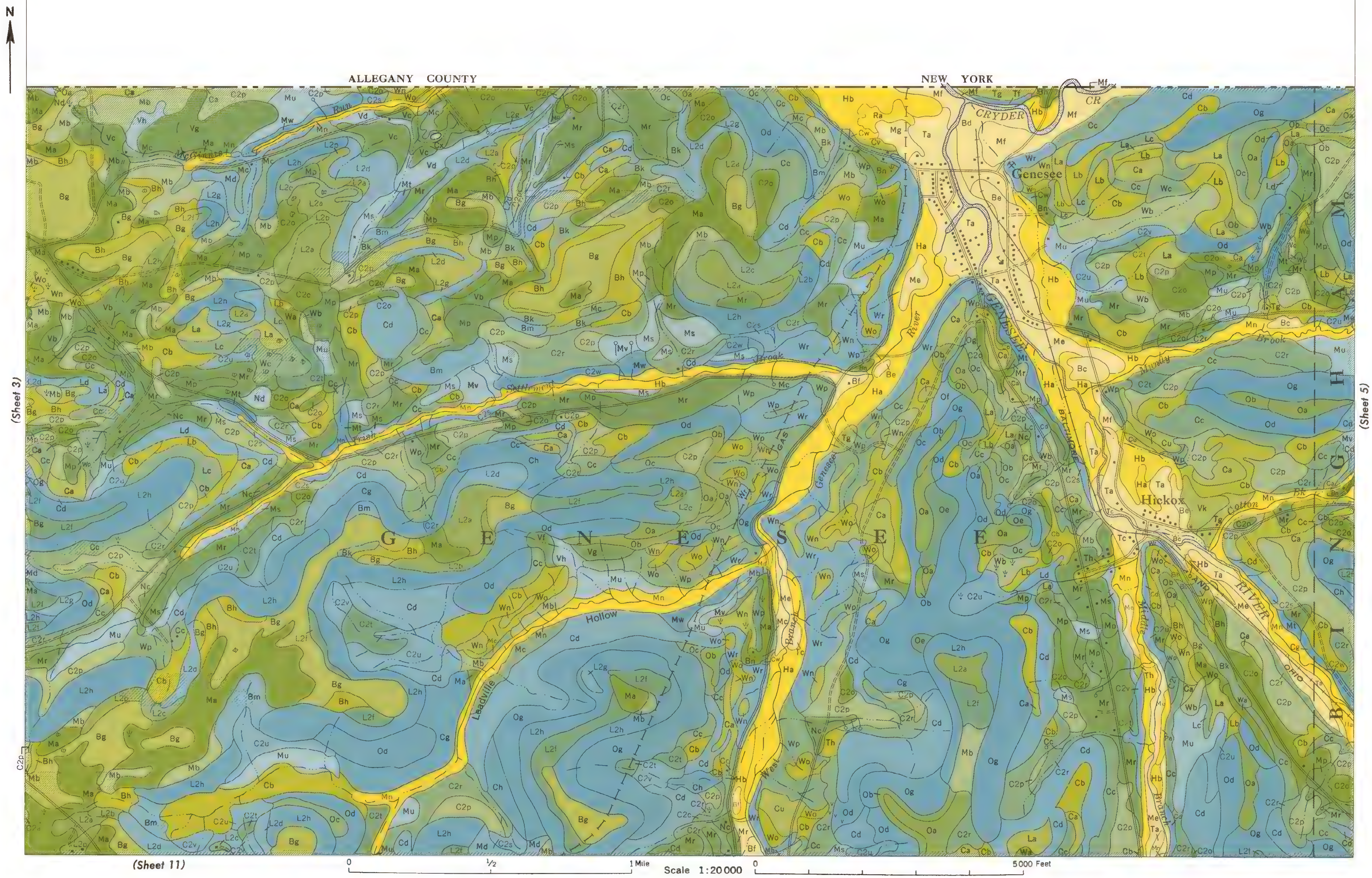
0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 10)

POTTER COUNTY, PENNSYLVANIA



N

ALLEGANY COUNTY

NEW YORK

(Sheet 4)

(Sheet 6)

(Sheet 12)

BINGHAM

North Bingham

Brook

Mundy

Cotton

Brook

Hollow

Shanty

Creek

Turner

Genesee

BALTIMORE & OHIO

River

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet


6
N
STEUBEN COUNTY
NEW YORK
White Corners
Ross Brook
BINGHAM
HARRISON
North Branch
Marsh Creek
(Sheet 5)
(Sheet 7)
(Sheet 13)
0
1/2
1 Mile
Scale 1:20 000
0
5000 Feet

N

NEW YORK

STEUBEN COUNTY

TIOGA COUNTY

(Sheet 6)

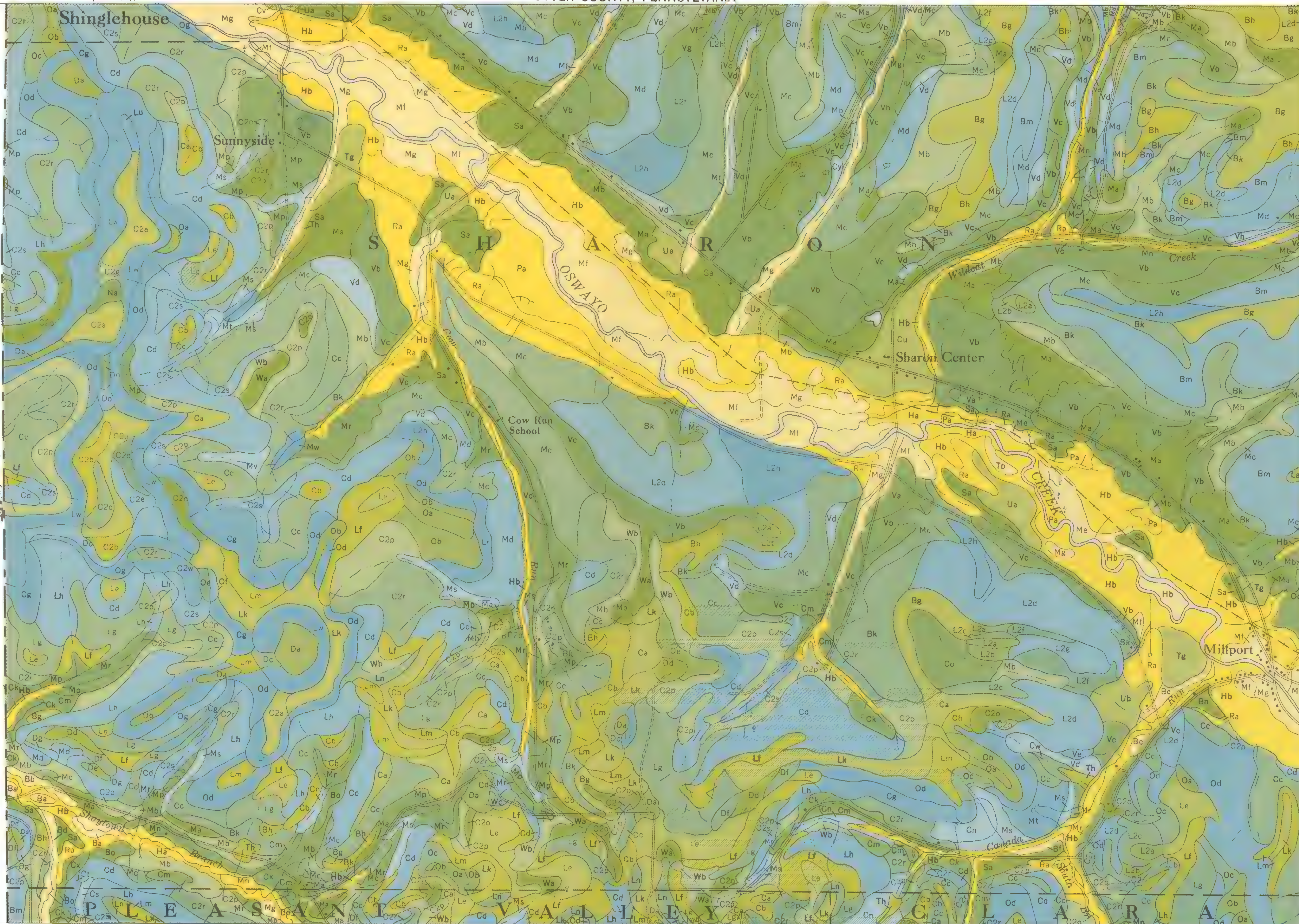
(Sheet 14)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

N



(Sheet 9)

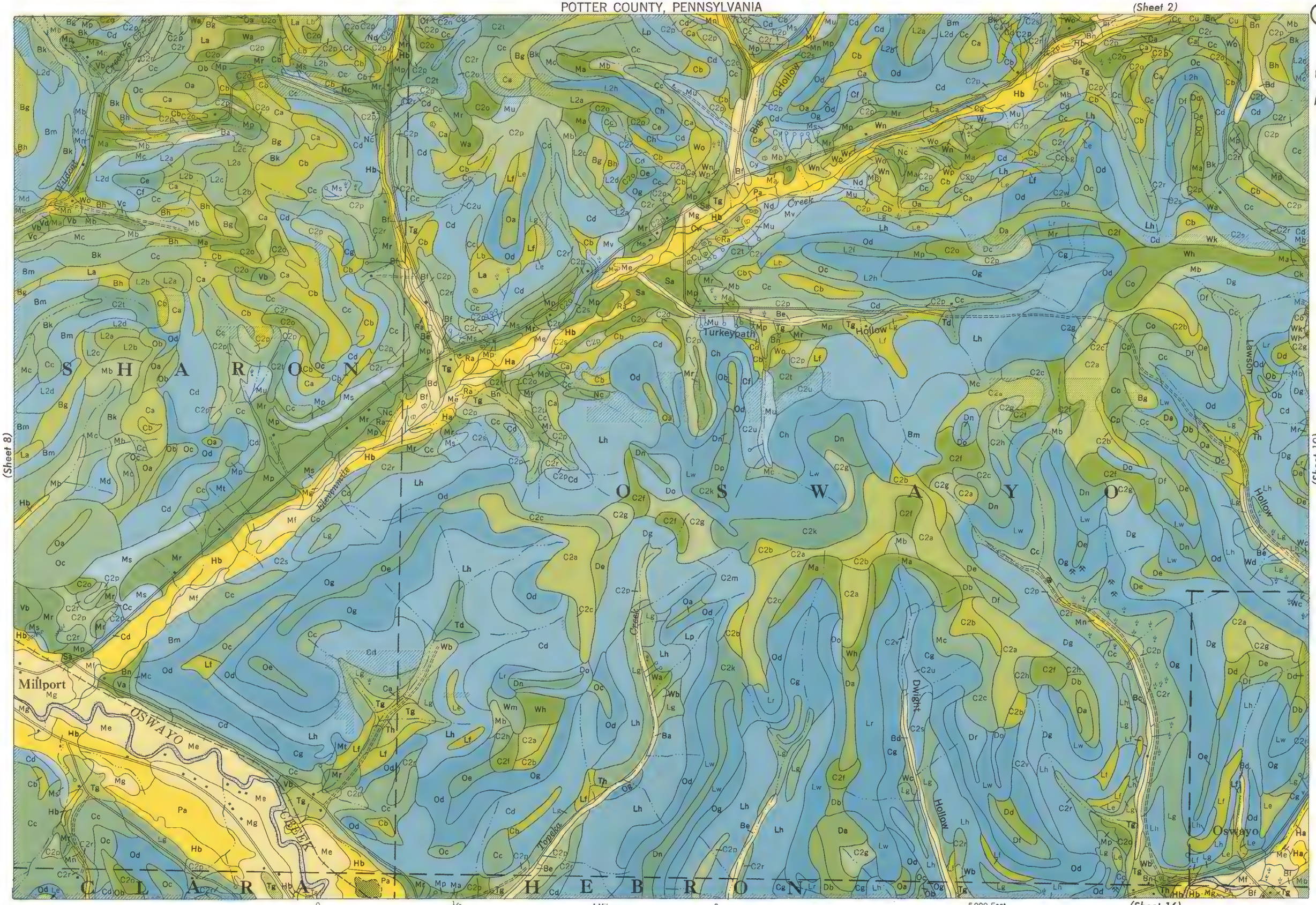
0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

(Sheet 2)

N

(Sheet 8)

(Sheet 10)



0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 16)

(Sheet 3)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 9)

(Sheet 11)

(Sheet 17)

Oswayo Hollow

Oswayo Creek

Kenyon Hollow

Tyler Hollow

Butler Hollow

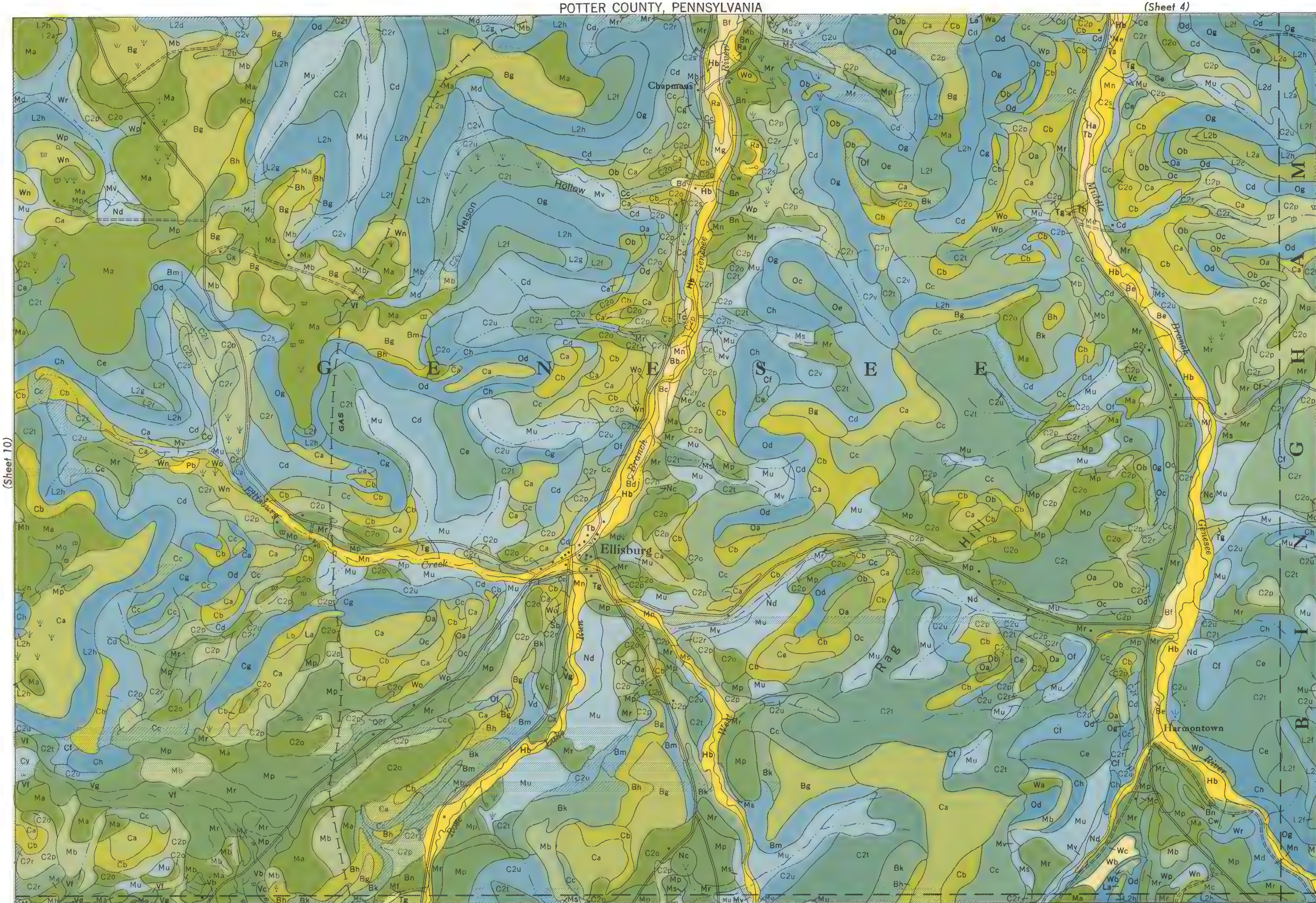
Oswayo Branch

Genesee

0 ½ 1 Mile

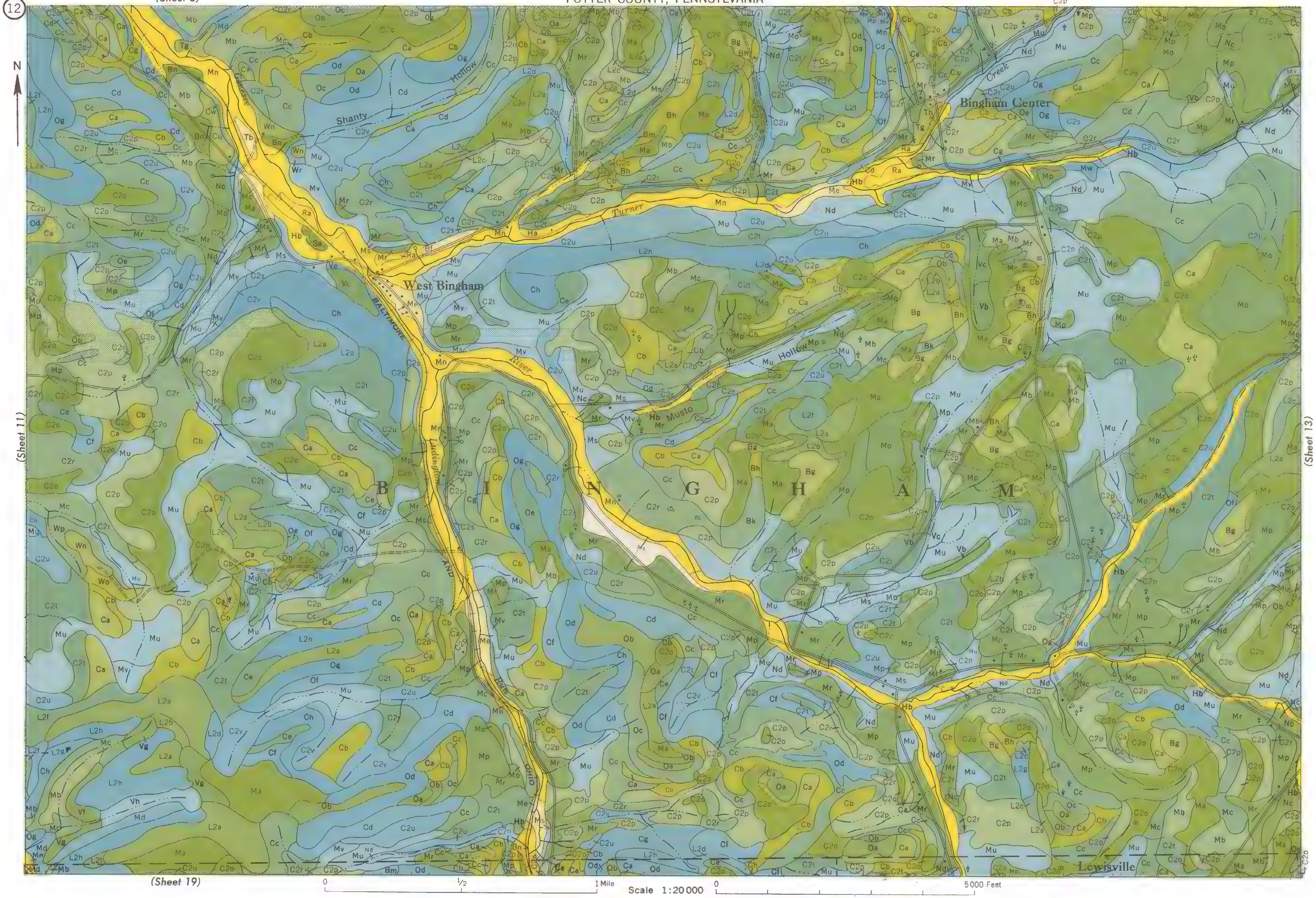
Scale 1:20000

0 5000 Feet



Scale 1:20 000
0 ½ 1 Mile
0 5000 Feet

POTTER COUNTY, PENNSYLVANIA



13

N

(Sheet 12)

(Sheet 14)

BINGHAM

HARRISON

HECTOR

Mills

Lewisville

Marsh Creek

Seamonesque River

Dodge Hollow Run

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

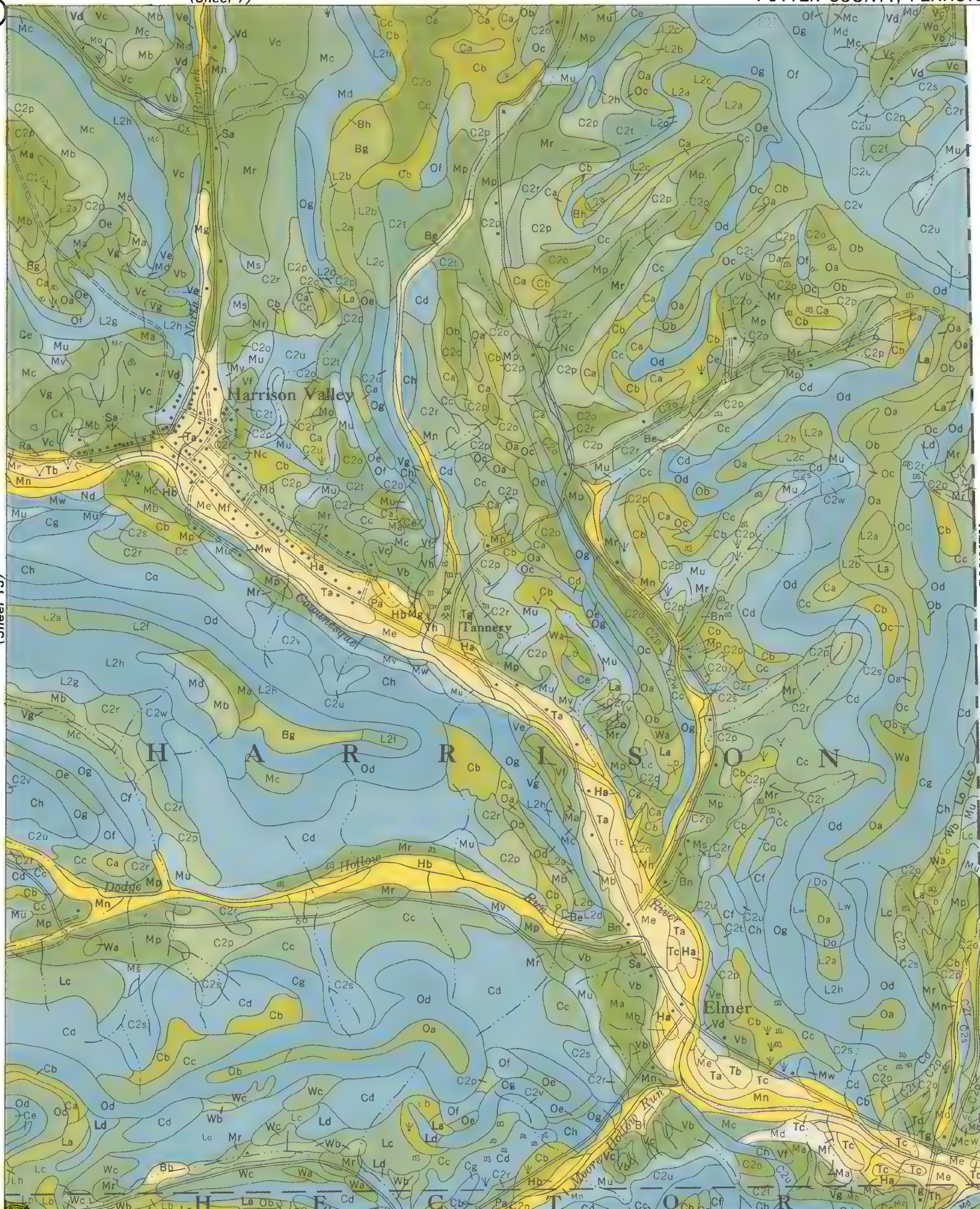
(Sheet 20)

14

(Sheet 7)

N

(Sheet 13)



(Sheet 21)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

N

(Sheet 16)

MC KEAN COUNTY

P L E A S A N T V A L L E Y

C L A R A H I L L

Shaytown

Shaytown Branch

South Branch

Hollow

Wokeley

Bradley Run

Welmer

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 22)

(Sheet 9)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 15)

(Sheet 17)

(Sheet 23)

C L A R A

H E B R O N

OSWAYO CREEK

Coneville

Clara School

Wokeley Hollow

Bradley Run

Clara Creek

Speed Creek

Sperl Hollow

Nigger Hill

West Branch Sa

Branch Sa

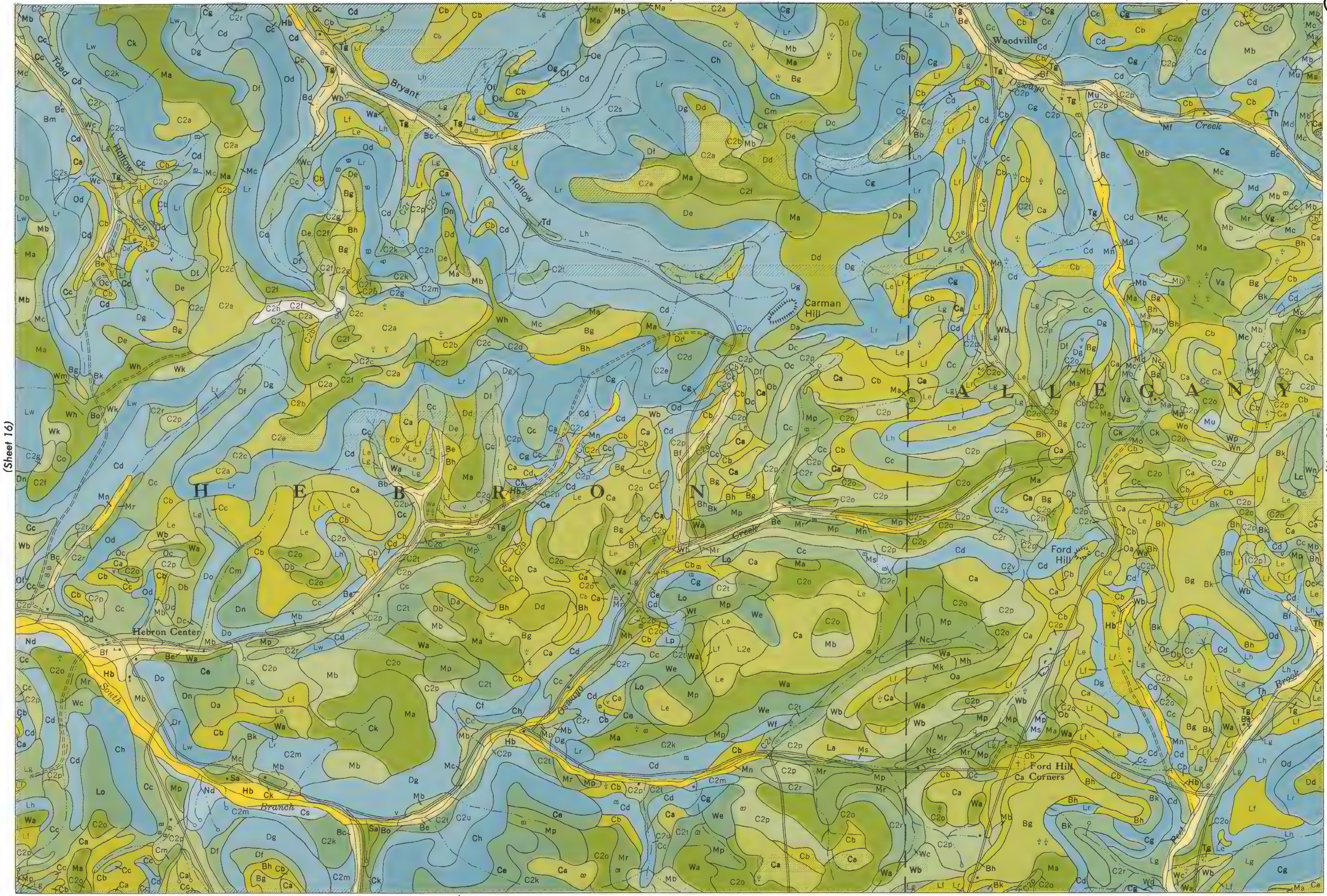
Osmania

Creek

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet



Scale 1:20000 — 0, ½, 1 Mile; 0, 5000 Feet

(Sheet 11)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 17)

(Sheet 19)

(Sheet 25)

Lewis Corner

Rose Lake

Andrews Settlement

Reynoldstown

Genesee River

West Branch Genesee River

Rose Lake Outlet

Le Peet Brook

Dwight Creek

Raplee Hollow

ALLEGANY

COBB

HILL

SUSQUEHANNA

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

POTTER COUNTY, PENNSYLVANIA

19

N

(Sheet 18)

(Sheet 20)

(Sheet 26)

Middle Branch

Genesee River

Pusher Siding

OHIO

Lewisville

LEWISVILLE

Newfield School

Kibboville Corners

Newfield

ALLEGANY AND BALTIMORE Bk

PORT ALLEGANY AND COUDERSPORT

Gold

Newfield Junction

ULYSSES

0 1 Mile ½

Scale 1:20000

0 5000 Feet

N

Lewisville

H E C T O R

U L Y S S E S

Lehman Creek

Pine Creek

Cushingville

Genesee

Pine Creek

Mill Creek

(Sheet 19)

(Sheet 21)

(Sheet 27)

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 20)

TIOGA COUNTY

(Sheet 28)

21

N

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Sheet 15)

POTTER COUNTY, PENNSYLVANIA

N

COUNTY

P L E A S A N T V A L L E Y

H I L L C R E S T

C L A R A

H O L L O W

Backwith Hollow

Weimer Hollow

Bear Creek

Williston Church

Sartwell Creek

Green Hollow

Fishbun Branch

West Branch

MC KEAN

(Sheet 29)

(Sheet 23)

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 22)

(Sheet 24)

N

Nigger Hill
Fishing Creek
Branch
Crandall Hill
West Hollow
Chopin
White Cg
Creek
Fishing
Branch
Hebron
Greenman Hill
Dingman
Run
C L A R A
H E B R O N

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

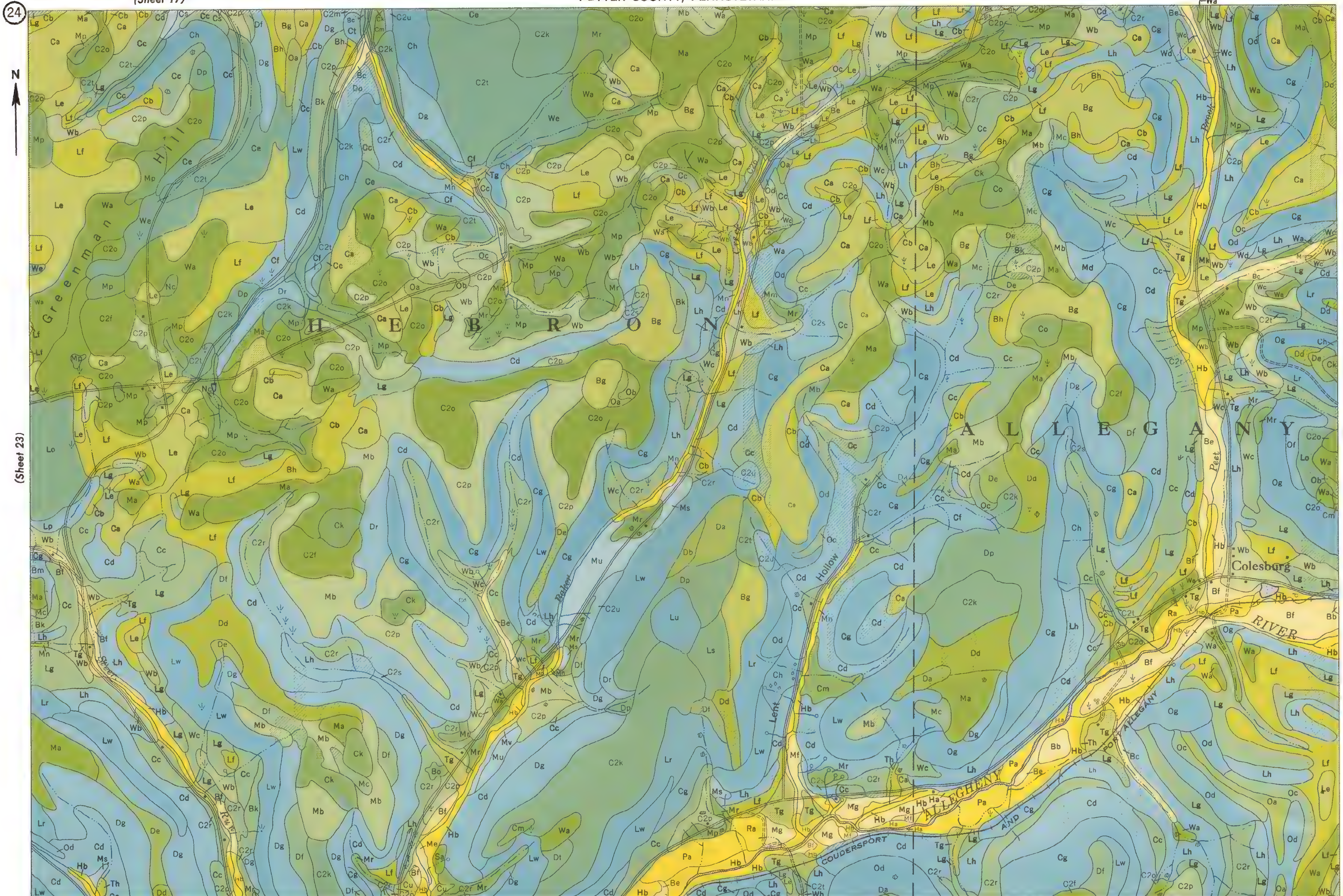
(Sheet 30)

24

(Sheet 17)

(Sheet 23)

(Sheet 25)



(Sheet 31)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Sheet 24)

(Sheet 26)

N

Raymond

ALLEGANY

PORT ALLEGANY

Creek

Dwight

Tunungwant Creek

Allegheny River

Woodcock Creek

Warnbold Hollow

Gross Hollow

Seven Bridges Hollow

Keller Hollow

COUDERSPORT

AND

HO-WAH-WE CAMP

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 32)

N

(Sheet 25)

(Sheet 27)

(Sheet 33)

U L Y S S E S

Baltimore

Heath Hollow

Homestead Cy

Hollow

Reese Hollow

Reese Run

Griffith Creek

Ohio Creek

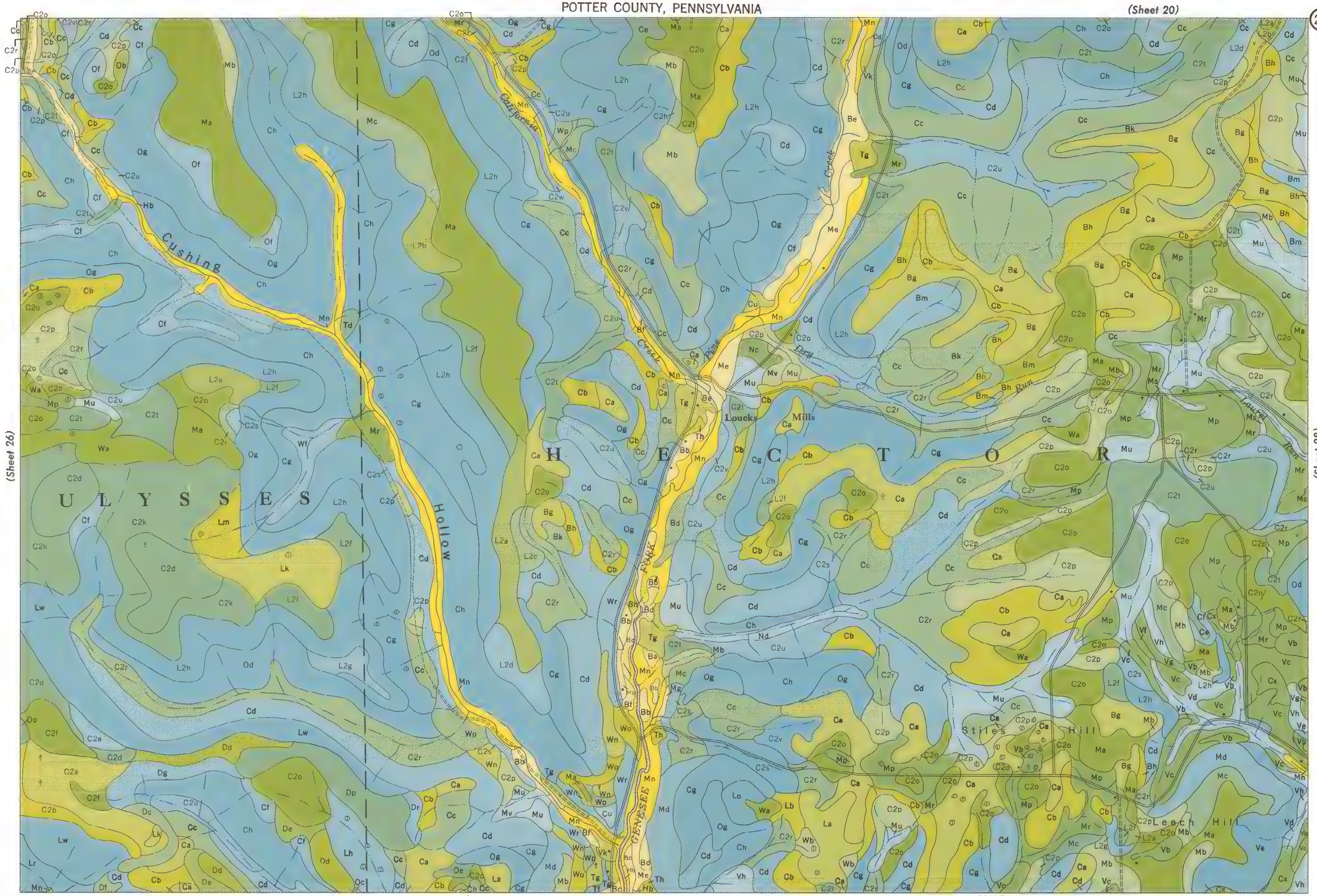
Jones Run

Brockland

0 1 Mile ½

Scale 1:20000

0 5000 Feet



(Sheet 26)

(Sheet 28)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 34)

(Sheet 21)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 27)

HECTOR

POTTER COUNTY

TIOGA COUNTY

Hector

Sunderlinville

Scott Hollow

Pine Creek

Laurel Run

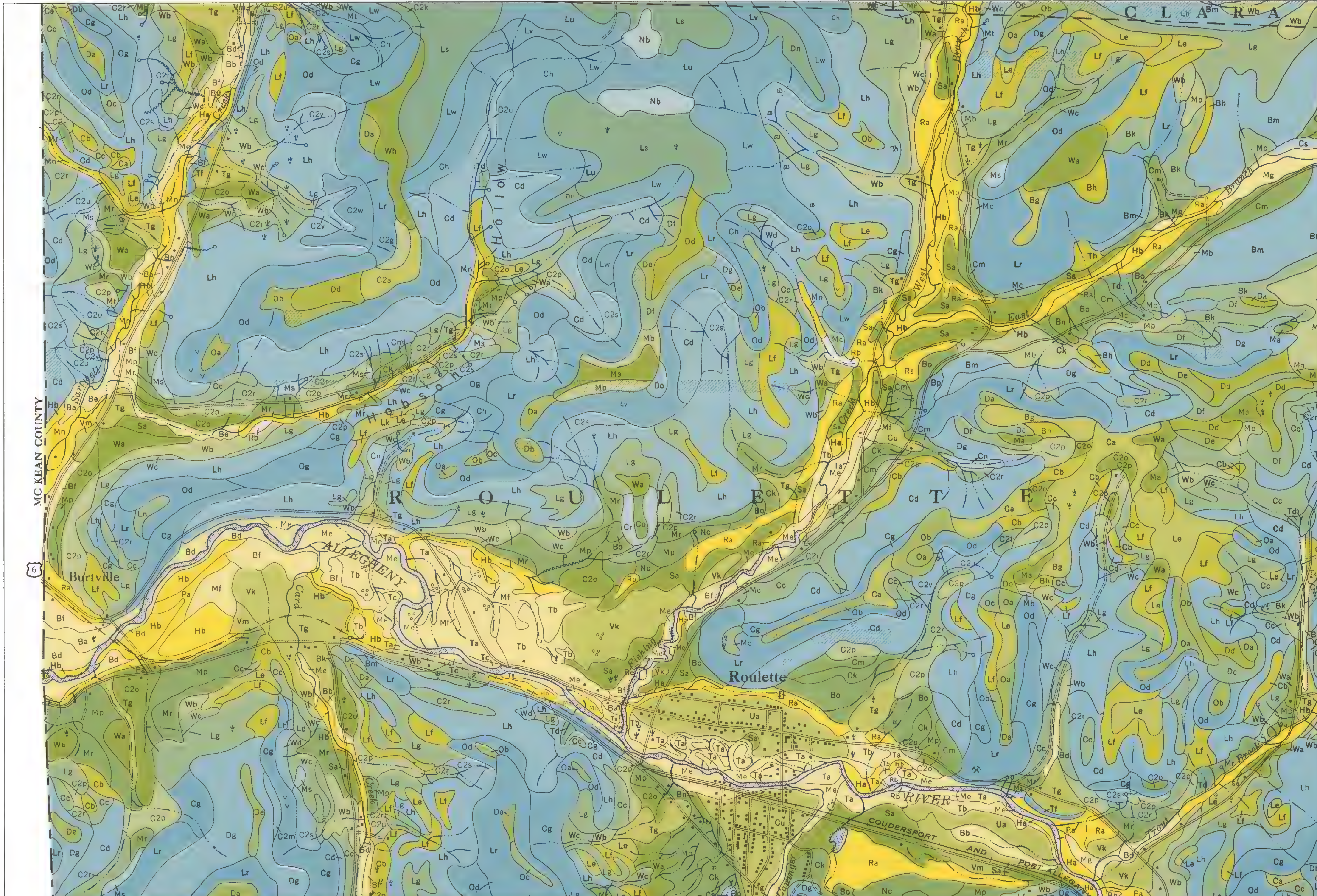
Little Pine Creek

(Sheet 35)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet



Scale 1:20000 — 0 — 1/2 — 1 Mile — 0 — 5000 Feet

(Sheet 36)

N

CLARA

HEBRON

ROULETTE

EULALIA

LIBERTY

Fishing Creek

East Branch

Hogpen Hollow

Dingman Run

Dingman Run School

Brook

Trout Run

Town Run

COUDERSPORT

(Sheet 29)

(Sheet 31)

(Sheet 37)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

31

N

(Sheet 30)

(Sheet 32)

HEBRON

ALLEGANY

EULALIA

SWEDEN

Steer Run

Baker Creek

ALLEGANY RIVER

Frinks

Hb Ck PORT ALLEGANY

Prosser Cd

Hollow

North Hollow School

North Hollow

COUDERSPORT

COUDERSPORT ALLEGHENY

Mill Creek

Lymansville

6

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Sheet 38)

N

ALLEGANY

SWEDEN

Wambold Hollow

Gross Hollow

SWEDEN HILL CEMETERY

Sweden

Lyon Run

Creek

Dry Run

Ninemile Run

6

(Sheet 31)

(Sheet 33)

(Sheet 39)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 26)

N

(Sheet 32)

(Sheet 34)

(Sheet 40)

U L Y S S E S

Buckseller Run

Jones Run

Pine Brook

Baxter Run

Commissioner Run

Ninemile Run

Dry Run

Lossey Run

Meade Creek

BALTIMORE AND OHIO

Walton

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 27)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 33)

(Sheet 35)

(Sheet 41)

HECTOR

ULYSSES

PIKE

Harrscrabble Creek

Pine Hollow

Judson Hollow

Meeker Hollow

Cabin Run

Pine Run

Lowery Run

Genesee Fork

Oswayo Creek

Telescope

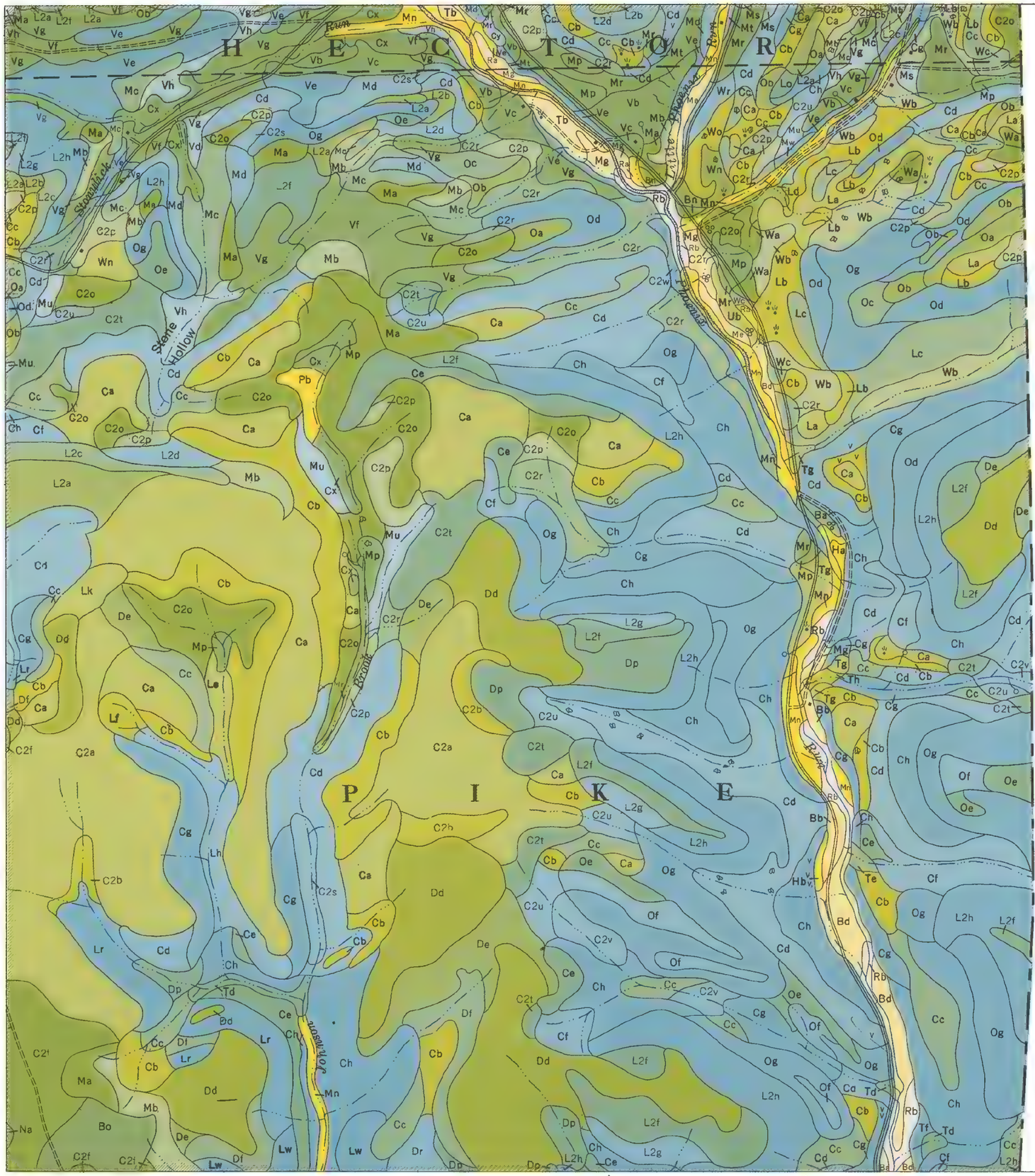
West Pike

BALTIMORE AND OHIO

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet



TIOGA COUNTY

(Sheet 34)

(Sheet 42)

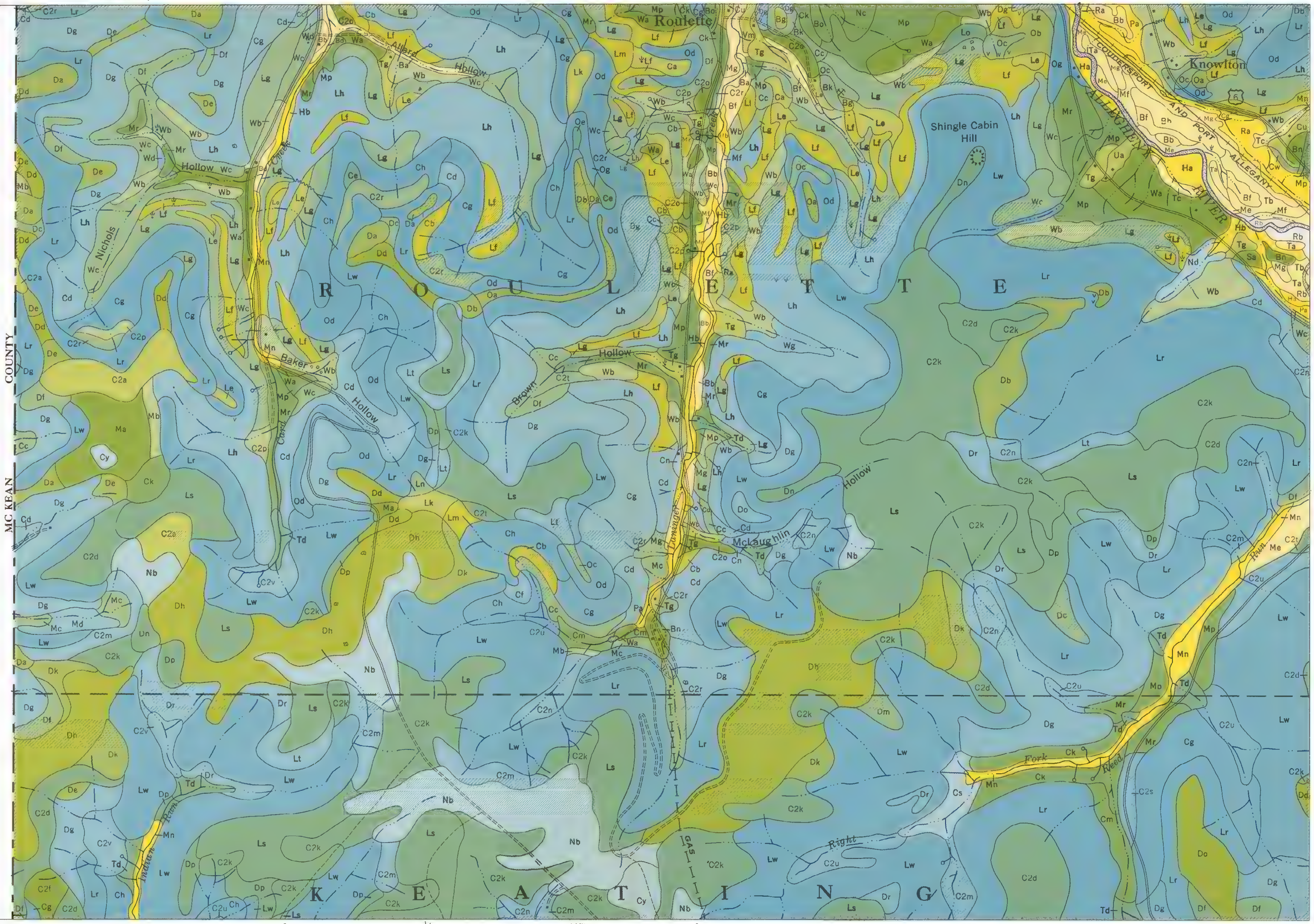
N

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

N



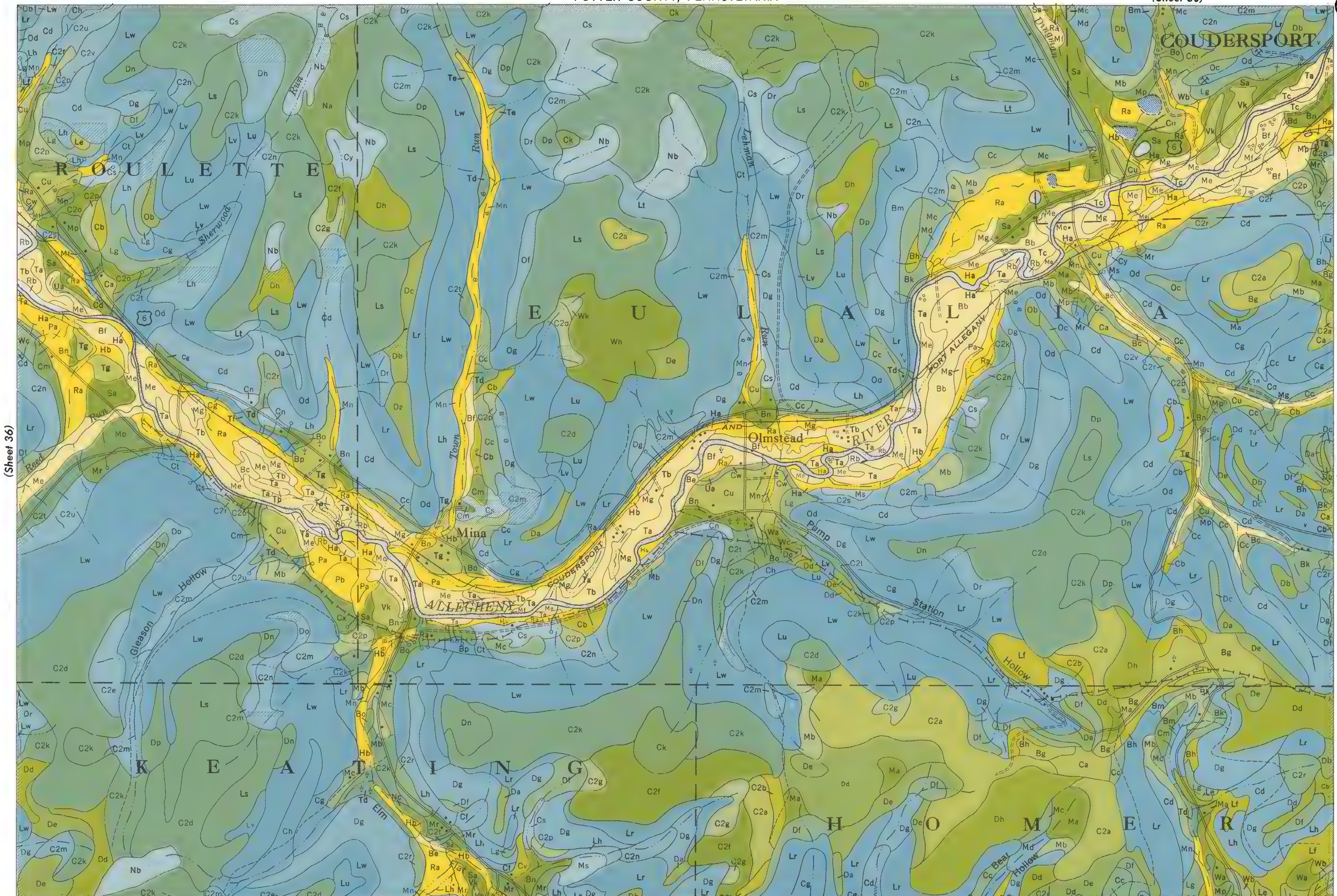
(Sheet 37)

(Sheet 43)

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Sheet 31)

POTTER COUNTY, PENNSYLVANIA

N

COUDERSPORT

Lymansville

Mill Creek

Lyman Run

Nelson Run

Jenkins Hill

Ayers Hill

Sweden Valley

ICE MINE

AYERS HILL CEMETERY

DUTCHMAN HILL

HOMER

SWEDEN

SUMMIT

(Sheet 37)

(Sheet 39)

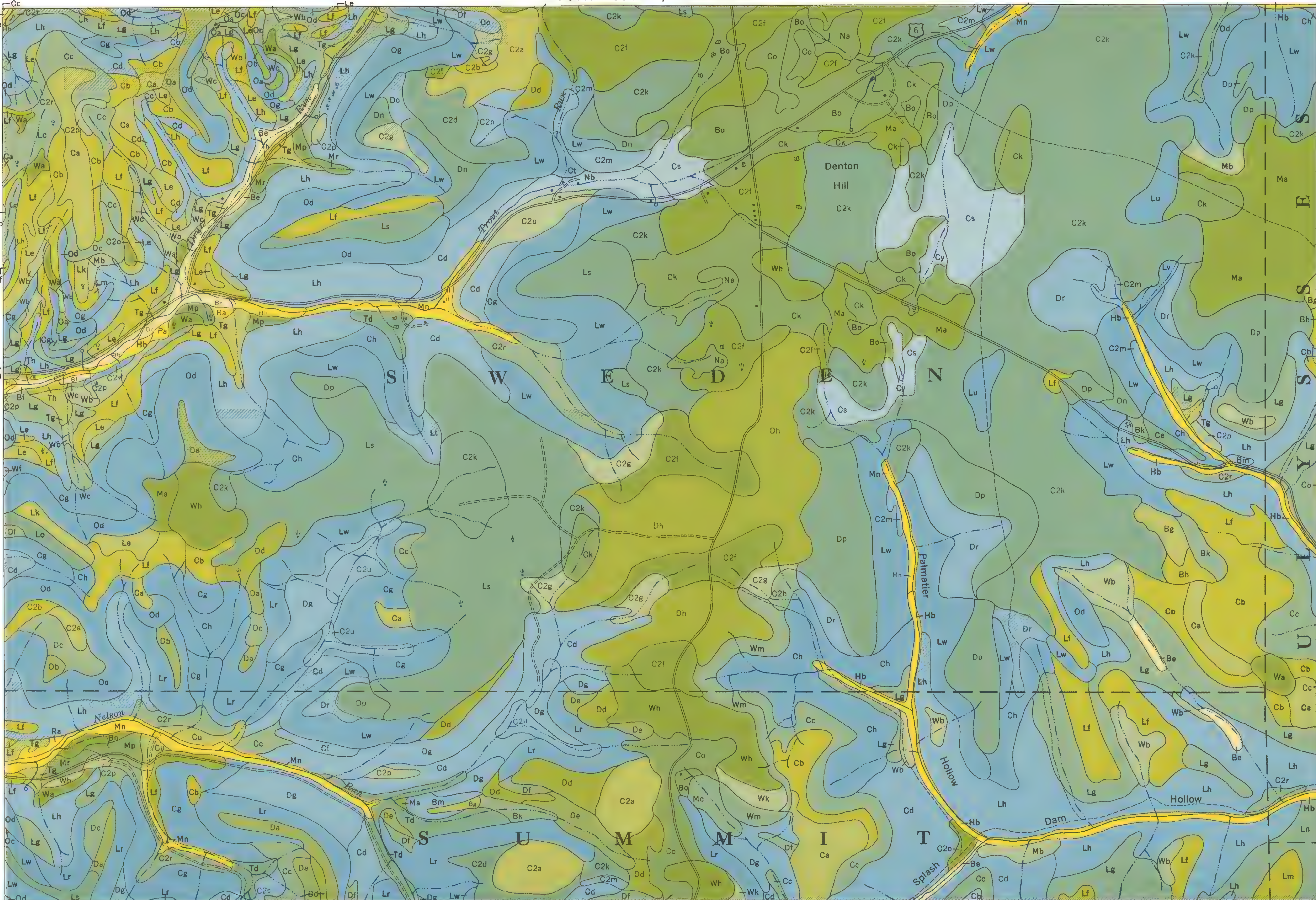
(Sheet 45)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 38)



(Sheet 40)

0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

(Sheet 46)

(Sheet 33)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 39)

(Sheet 41)

ULYSSES

WESTBRANCH

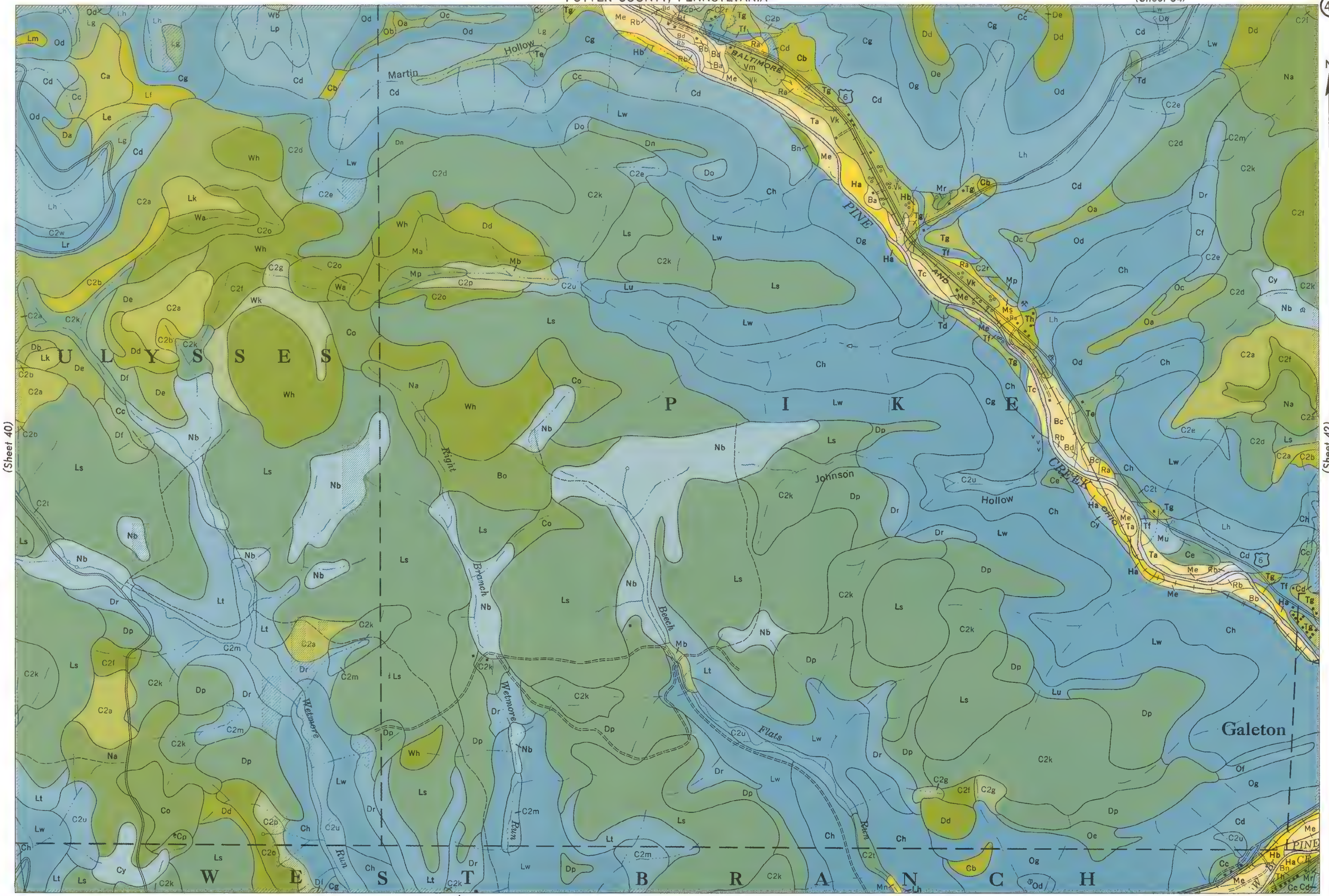
Run
Dry Run
Tossey Run
Binky Hollow
Lyman Run
Jacob Hollow
Daggett Hollow
Brown Hollow

(Sheet 47)

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet


N
ULYSSES
PIKE
WEST BRANCH
Galeton
Martin Hollow
Johnson Hollow
Right Branch
Wetmore Run
Beech Flats Run
Branch
PINE CREEK
BALTIMORE AND
(Sheet 40)
(Sheet 42)
(Sheet 48)
0 1 Mile
0 5000 Feet
Scale 1:20000

(Sheet 35)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 41)

(Sheet 49)

P I K E

W E S T B R A N C H

Galeton

Johnson Run

Phoenix Run

Pine Creek

WEST BRANCH

SOUTH BRANCH

B AND O

TIOGA COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

MC KEAN COUNTY

(Sheet 44)

N

Brown Hollow
Healey Hollow
Indian Run
Reed Run
Allegheny Creek
Portage
PENNSYLVANIA
Freeman
Odin
Lookout Mountain
Keating Summit
Right Branch Bark Shanty Hollow
Left Branch Bark Shanty Hollow
GAS

0 1/2 1 Mile
Scale 1:20000
0 5000 Feet

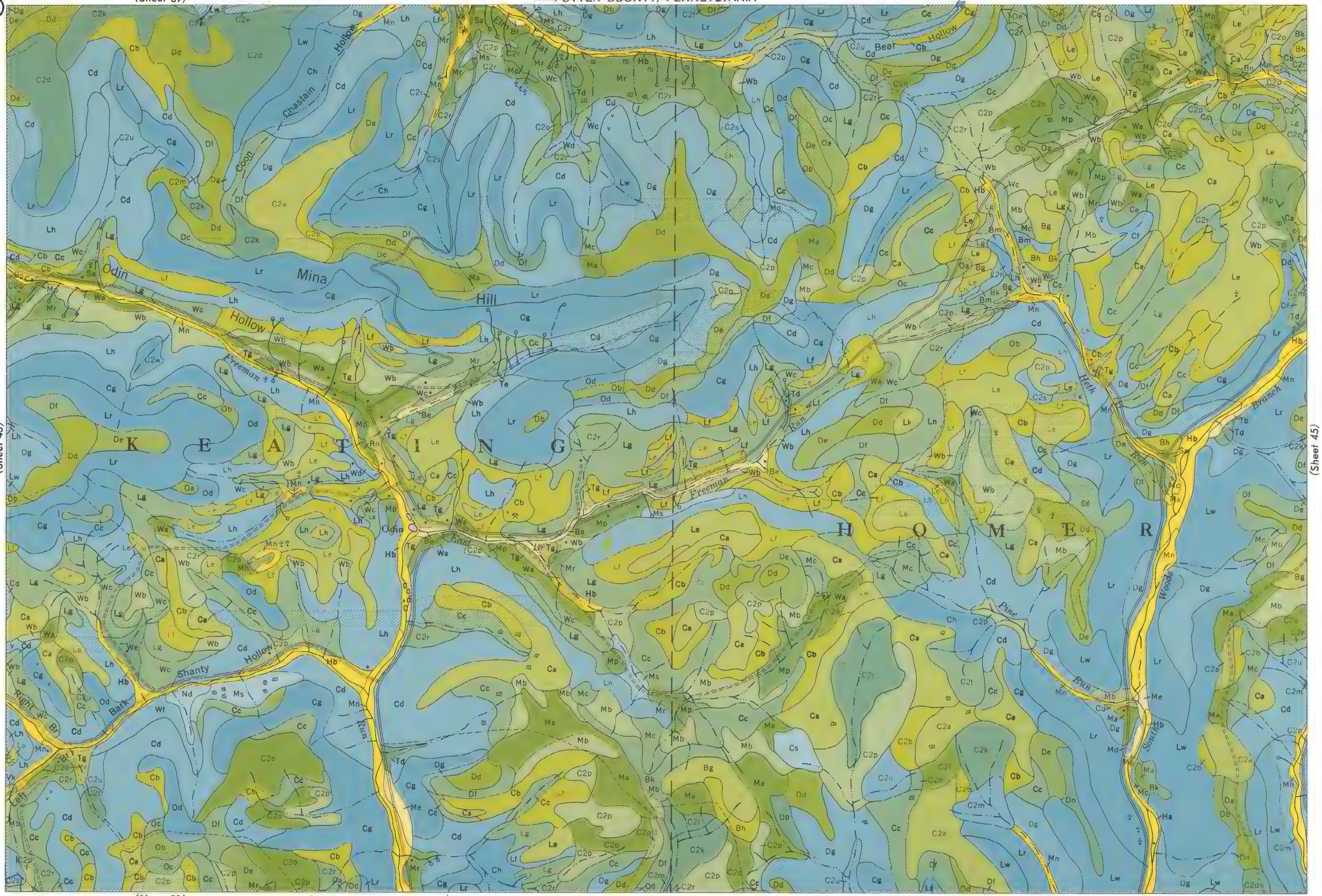
(Sheet 50)

(Sheet 37)

N

(Sheet 43)

(Sheet 45)



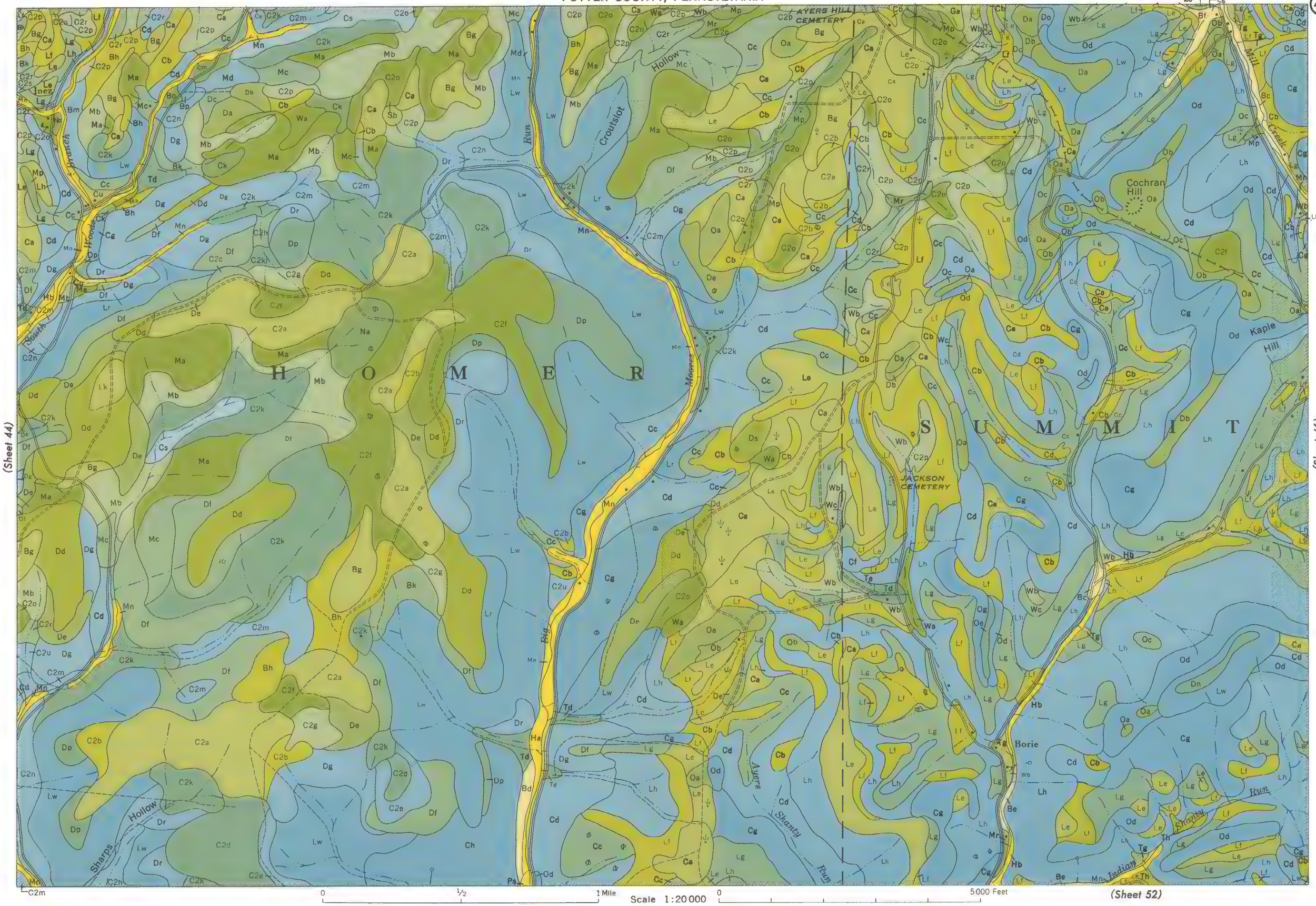
(Sheet 51)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 38)



(Sheet 44)

(Sheet 46)

(Sheet 52)

N

(Sheet 45)

(Sheet 47)

(Sheet 53)

SUMMIT

WESTBRANCH

Mill Creek

Kaple Hill

Splash Dam Hollow

Sunken Branch

West Branch

Pine Creek

Prouty Run

PATTERSON PARK

LITTLE CHERRY SPRINGS PARK

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 40)

(Sheet 46)

(Sheet 48)

(Sheet 54)

N

WEST BRANCH

Lyman Run Camp

Burrows

Corbett

Burdock Hollow

Lyman Run

Sunken Hollow

Barnes Branch

Indian Run

Burnt Branch

Pine Creek

West Branch

0 1/2 1 Mile

Scale 1:20 000

0 5000 Feet

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 47)

(Sheet 49)

(Sheet 55)

WEST BRANCH PINE CREEK

Lyman Run

Germania Station

Lyman Run Station

Burrows

Hults

Wetmore Run

Right Branch

Beech Run

Rock Run

LYMAN RUN

WEST BRANCH PINE CREEK

Ohio

Osgood

Crippen

Hollow

Sugar Bush Run

Lower Dry Hollow

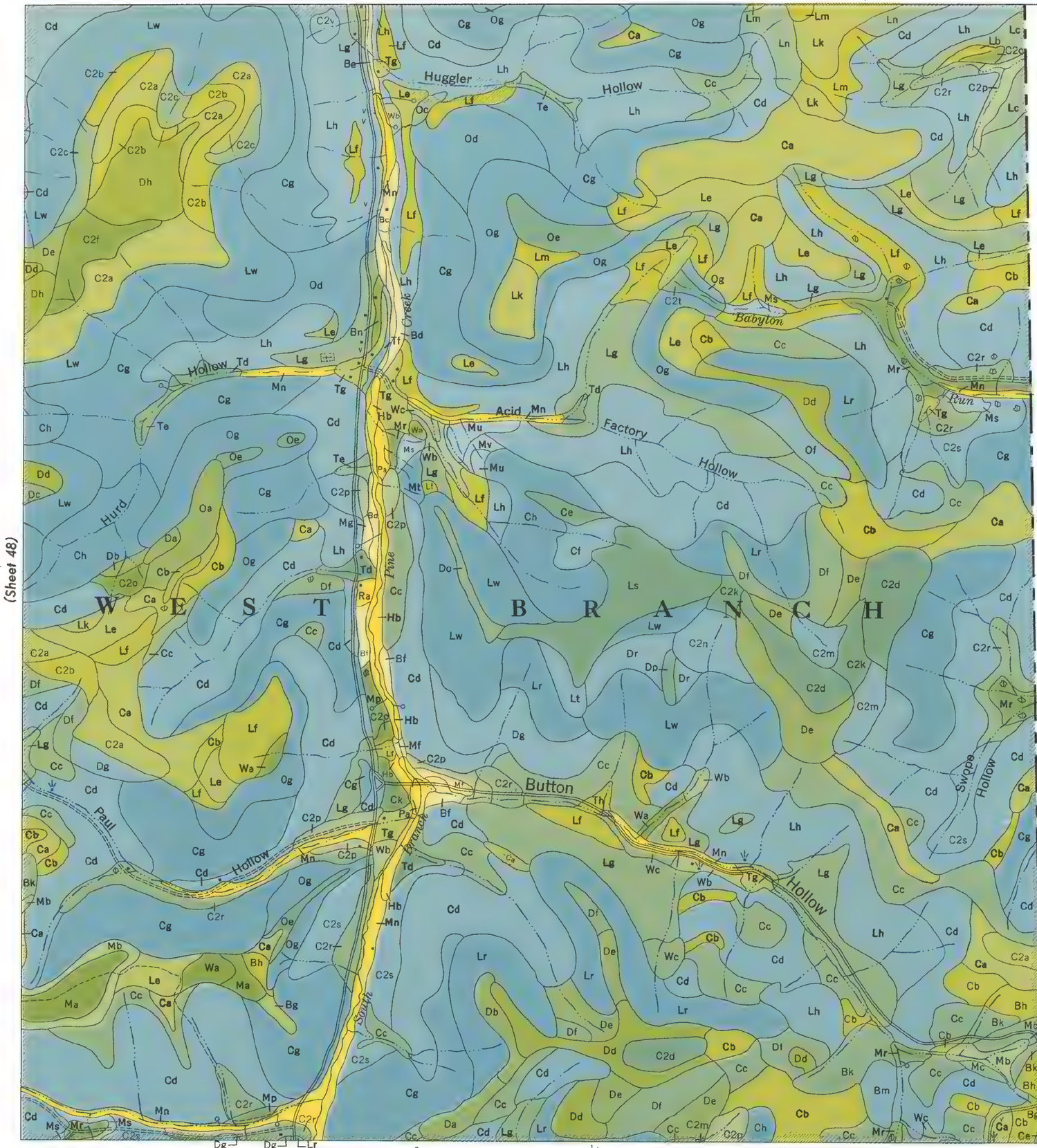
BALTIMORE

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

N



(Sheet 48)

TIOGA COUNTY

(Sheet 56)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

50

N

MC KEAN COUNTY

PENNSYLVANIA

Portage Hollow

Crawford Hollow

Bush Hollow

Couley Run

Andrew Hollow

West Branch Pine Creek

Buck Hollow

Freeman Run

Slabtown Hollow

Fox Mountain

Harrier Hollow

Pine Creek

East Branch Couley Run

K E A T I N G

P O R T A G E

(Sheet 51)

(Sheet 57)

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

N

KEATING

HOMER

PORTAGE

SYLVANIA

Jacob Run
Jones Run
Dry Run
Baker Mc Hollow
Branch
Barren Hollow
Woods Run
Donovan Hollow
Freeman Run
Cochrane Hollow
South Elevenmile Hollow
Austin

0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

(Sheet 50)
(Sheet 52)
(Sheet 58)

(Sheet 45)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 51)

(Sheet 53)

(Sheet 59)

HOMER

SUMMIT

SYLVANIA

Hollow

Windfall

Little Moores Run

Big Moores Run

Run

Pine Run

Ayers Run

Shanty Cb

Indian Run

Skinny Run

Branch

Dearing Run

Prouty Run

CREEK

Beech Run

SINNEMAHONING

FORK

Elic Run

Lick Run

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

(Sheet 52)

(Sheet 54)

N

WEST BRANCH

SUMMIT

Prouty Place Camp

Prouty

Bunleson

Horton

Ford Hollow

Card Hollow

Bum Run

Read

Branch

Lick

Stony

East Fork

Simmonahoning Creek

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 60)

(Sheet 47)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 53)

(Sheet 55)

(Sheet 61)

WEST BRANCH

EULALIA

ABBOTT

CHERRY SPRINGS FIRE TOWER

Cherry Springs Park

Mount Brodhead

West Branch

Pine Creek

Hollow

House Hollow

Upper Dry Hollow

Tank Hollow

Water Hollow

Hopper Hollow

Hogback Hollow

Shinglebolt Hollow

Winegarden Run

Bolich Run

Scale 1:20 000

0 1/2 1 Mile

0 5000 Feet

55

N

WEST BRANCH

The Notch

Bushy Point

Sugar Ridge

Pigeon Hill

Germania

Germania Branch

Kettle Creek

Boetler Run

Upper Dry Hollow

Wenzel Hollow

Long Bean Hill

Club Hill

(Sheet 54)

(Sheet 56)

(Sheet 62)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Sheet 49)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 55)

(Sheet 63)

TIOGA COUNTY

WEST BRANCH

Germania Hill

Pigeon Hill

South Br Pine Creek

Germania Mountain

Bibiana Mountain

Straight Run

Sliders Run

Bear Ridge

Club Run

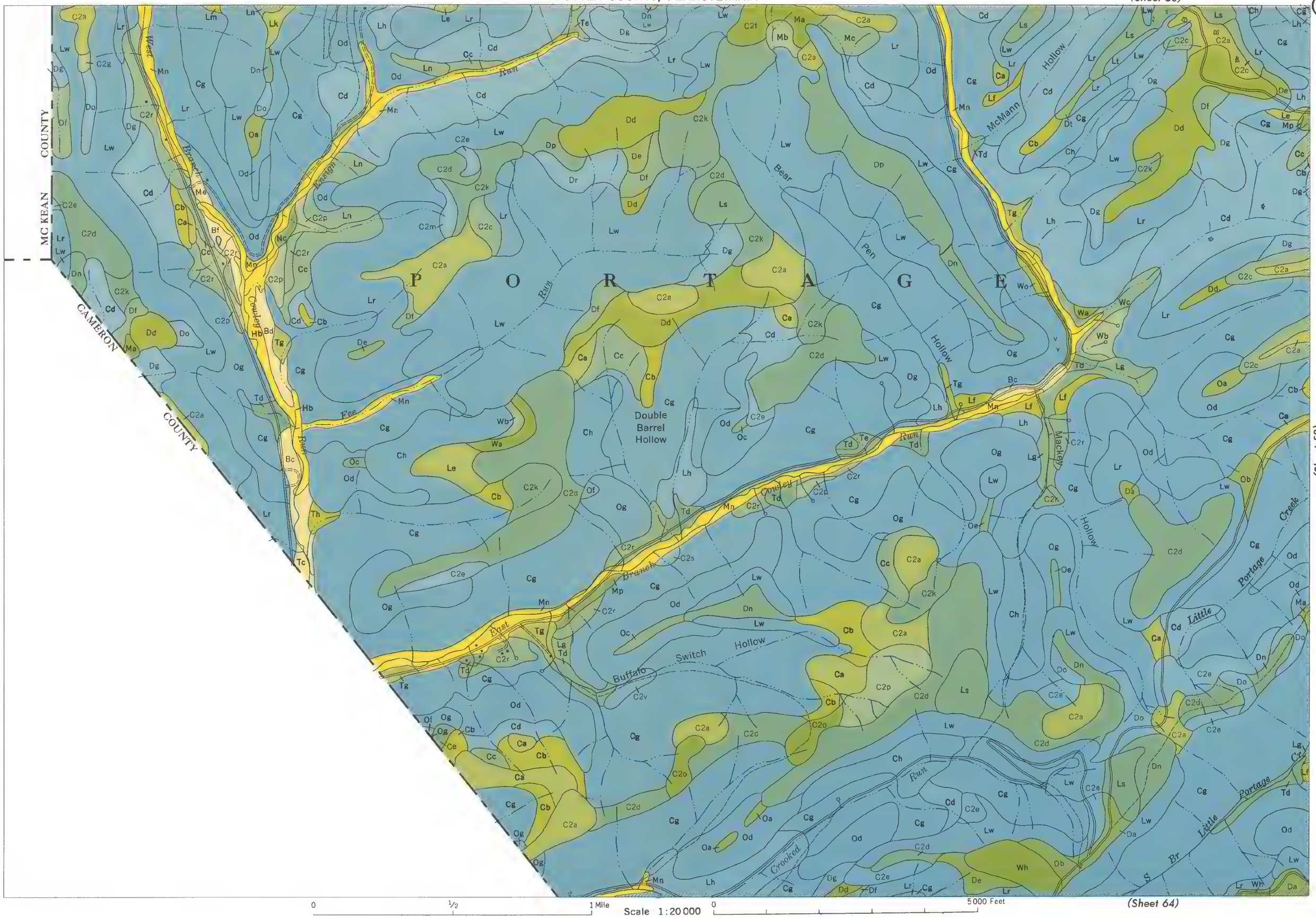
Germania Branch

Straight Run

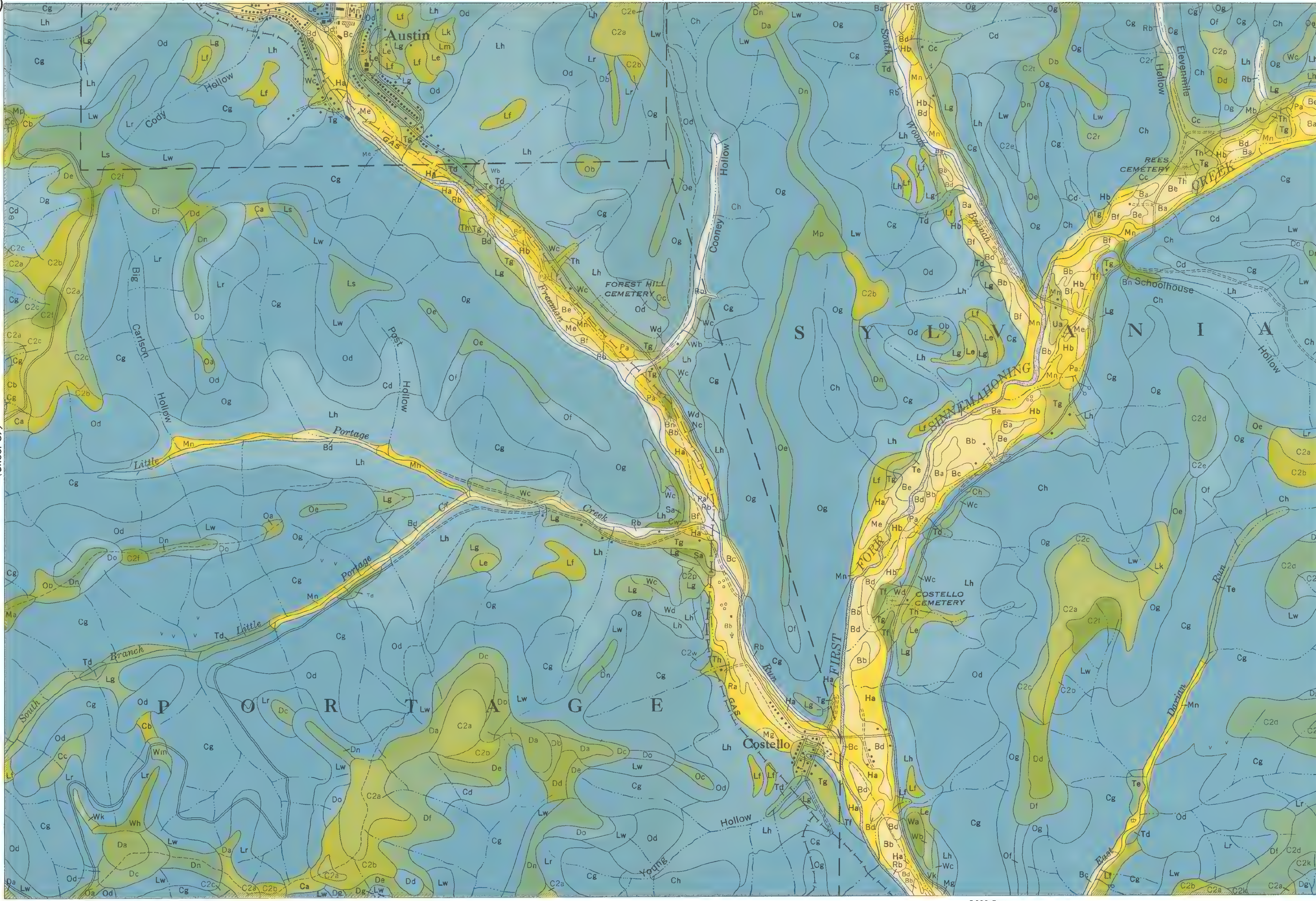
0 1/2 1 Mile

Scale 1:20000

0 5000 Feet


N
MC KEAN COUNTY
CAMERON COUNTY
P O R T A G E
Bear Run
Pen Hollow
McMann Hollow
Mackey Hollow
Double Barrel Hollow
Buffalo Switch Hollow
Crooked Run
Cowley Run
Fee Run
Ensign Run
West Branch
East Branch
Portage Creek
Little S Br
(Sheet 58)
(Sheet 64)
0 1/2 1 Mile
Scale 1:20 000
0 5 000 Feet

(Sheet 51)



(Sheet 57)

(Sheet 59)

(Sheet 65)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

N

(Sheet 58)

(Sheet 60)

SYLVANIA

SUMMIT

WHARTON

First Fork Sinnemahoning

Gravel Lick Run

Railroad

Hollow

Nelson Run

Big Branch

Card Hollow

Left Branch

Right Branch

Birch Run

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 66)

(Sheet 53)

(Sheet 59)

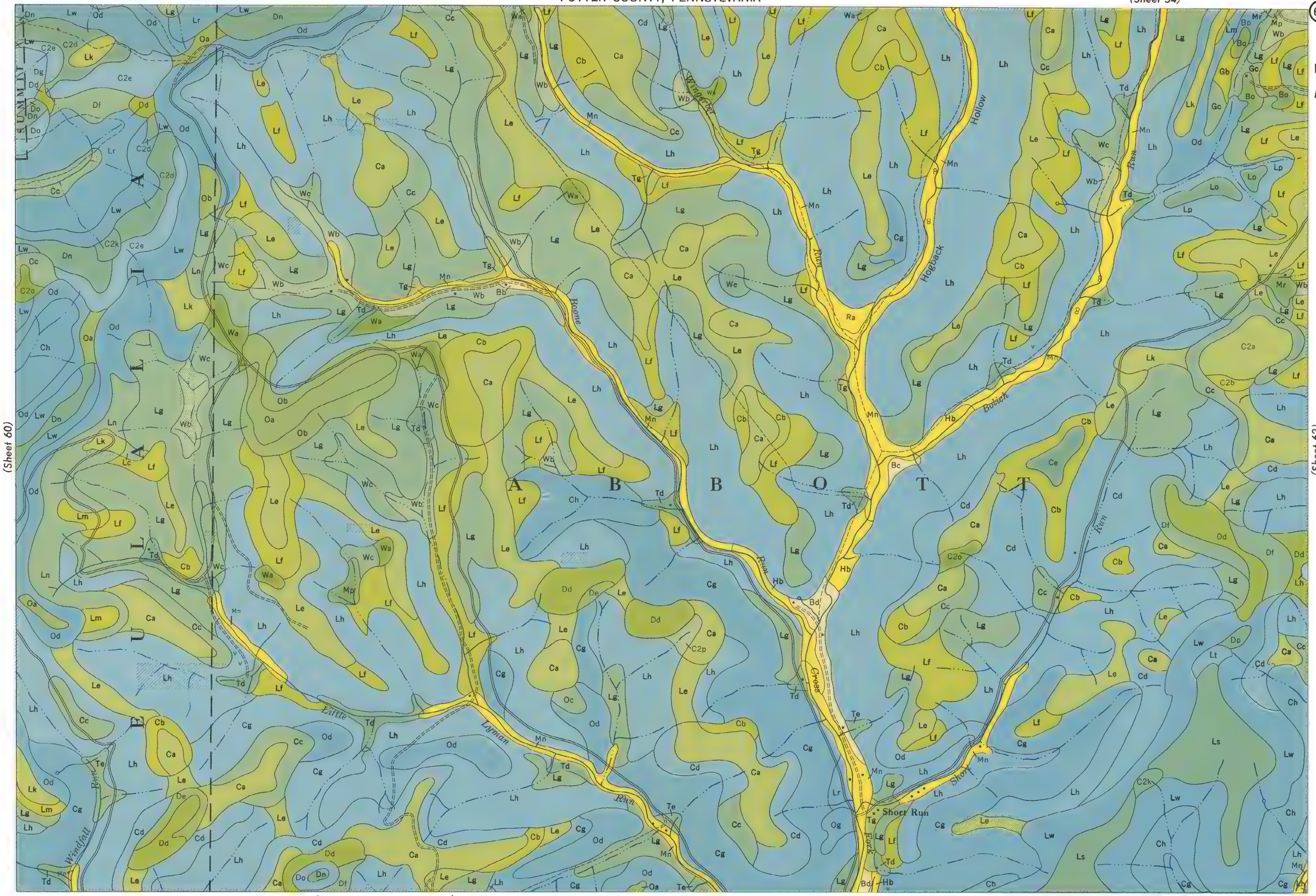
(Sheet 61)

(Sheet 67)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet



(Sheet 60)

(Sheet 62)

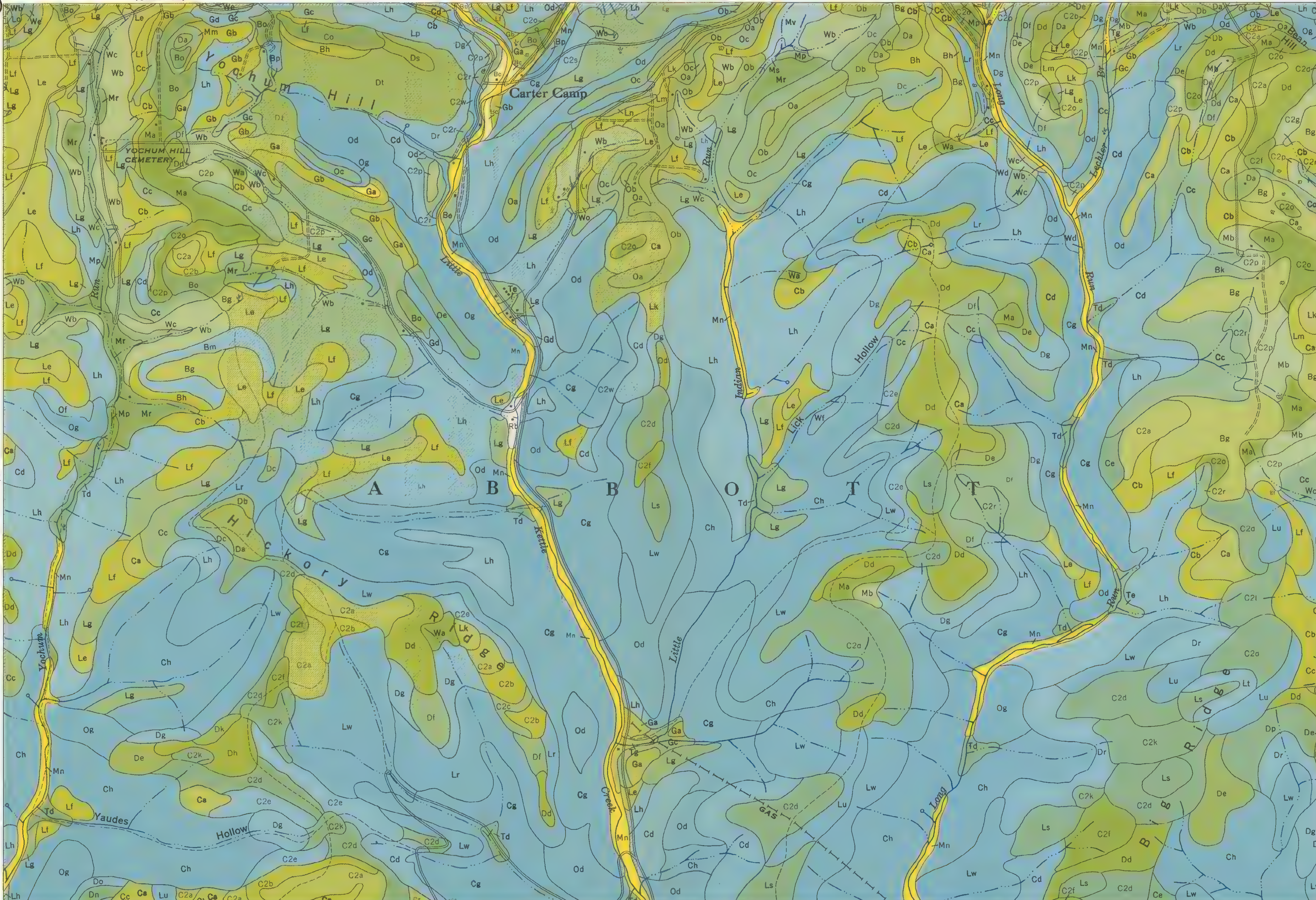
0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 68)

(Sheet 55)



(Sheet 61)

(Sheet 63)

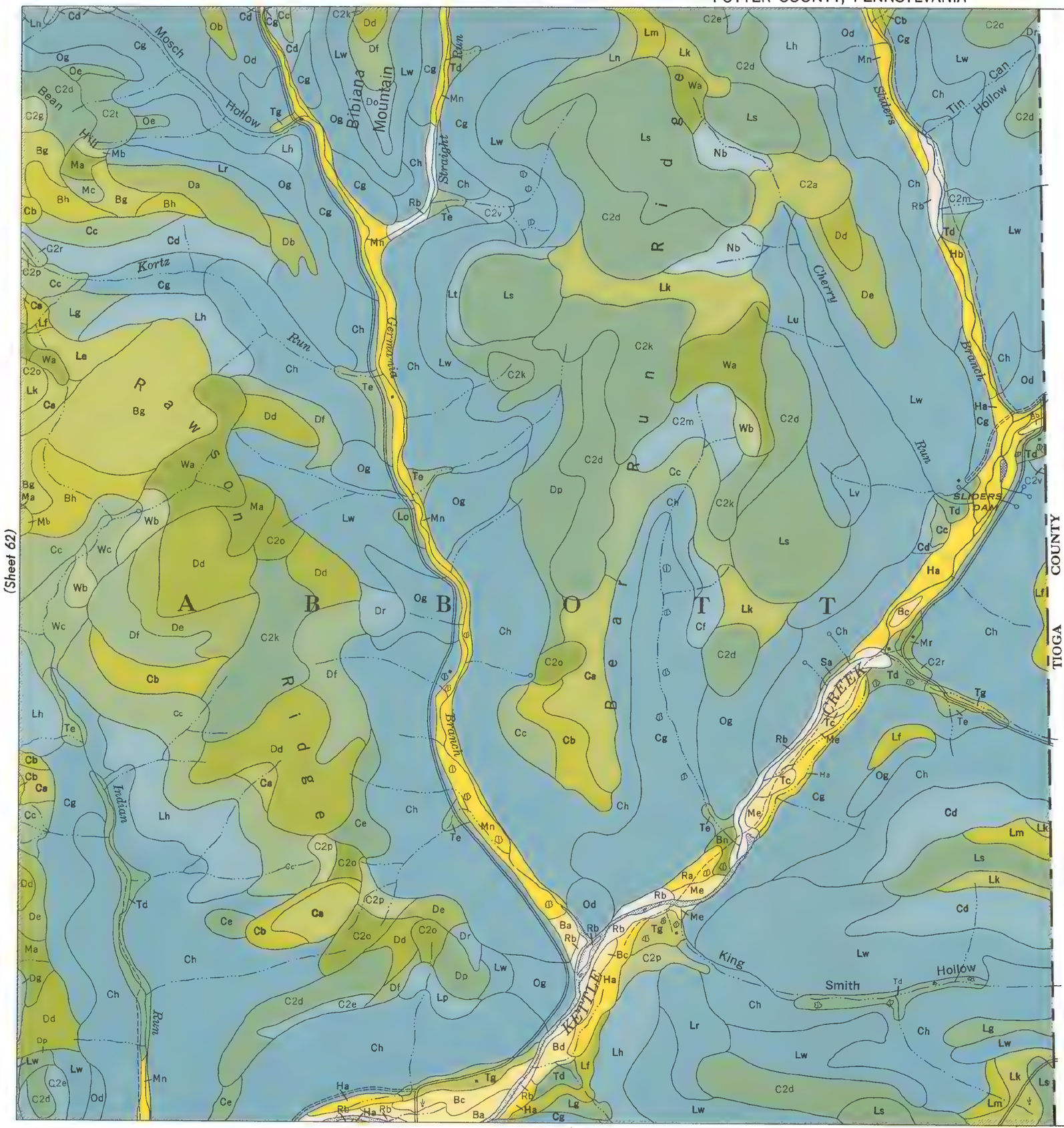
(Sheet 69)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

N



(Sheet 62)

(Sheet 70)

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 57)

POTTER COUNTY, PENNSYLVANIA

N

POTTER

CAMERON COUNTY

Crooked Run
Salt Run
Baxter Run
McNaul Branch

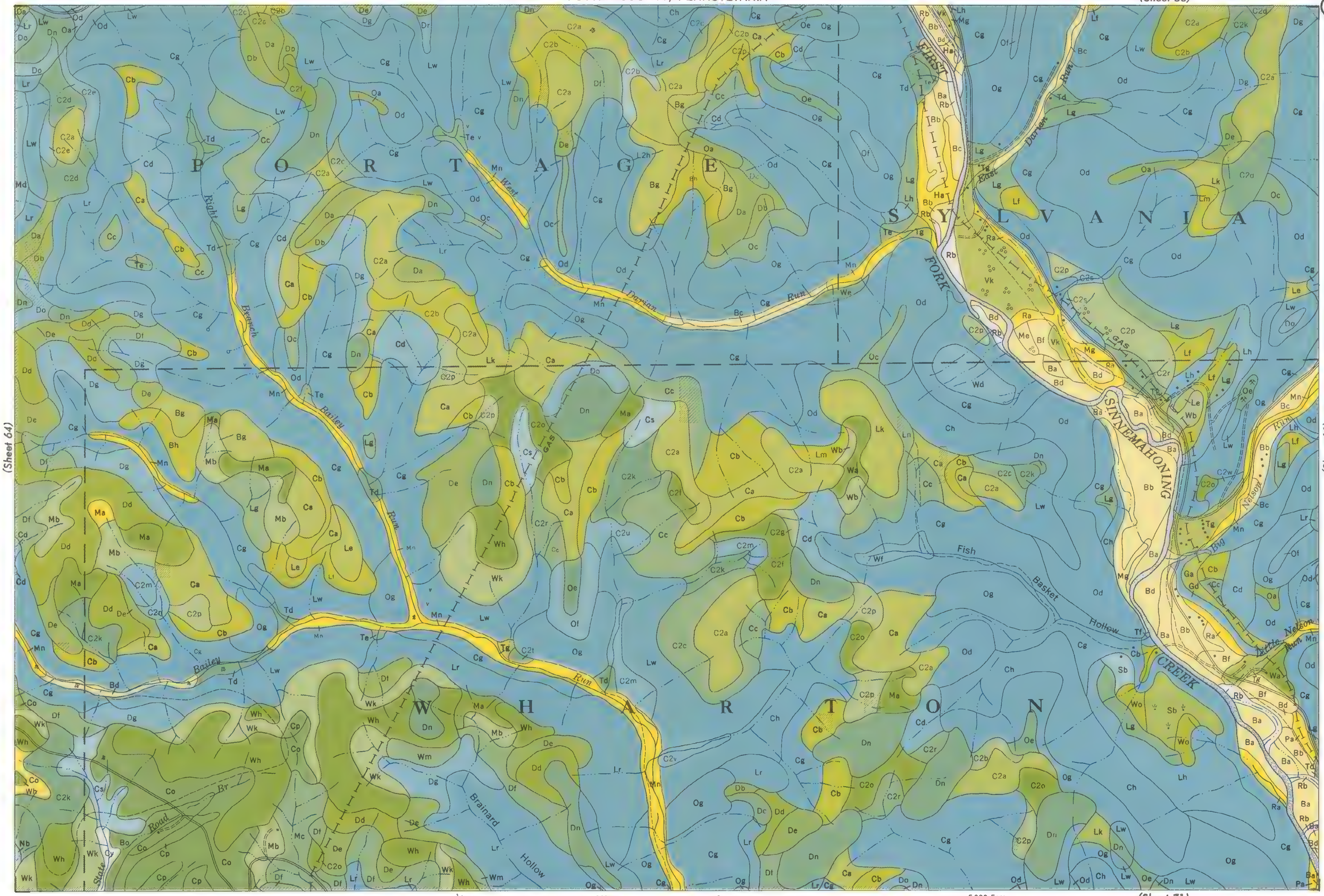
(Sheet 65)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 71)



(Sheet 64)

(Sheet 66)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 71)

(Sheet 59)

(Sheet 65)

(Sheet 67)

(Sheet 72)

N

SYLVANIA

WHARTON

Branch Card Hollow

Left Branch

Right Branch

Gas Well Hollow

Nelson Run

Big Run

Little Nelson Run

Black Run

Stump Hollow

Schoolhouse Run

Birch Run

Williams Run

Jordan Hollow

EAST BRANCH SINNEMAHONING CREEK

Logue Run

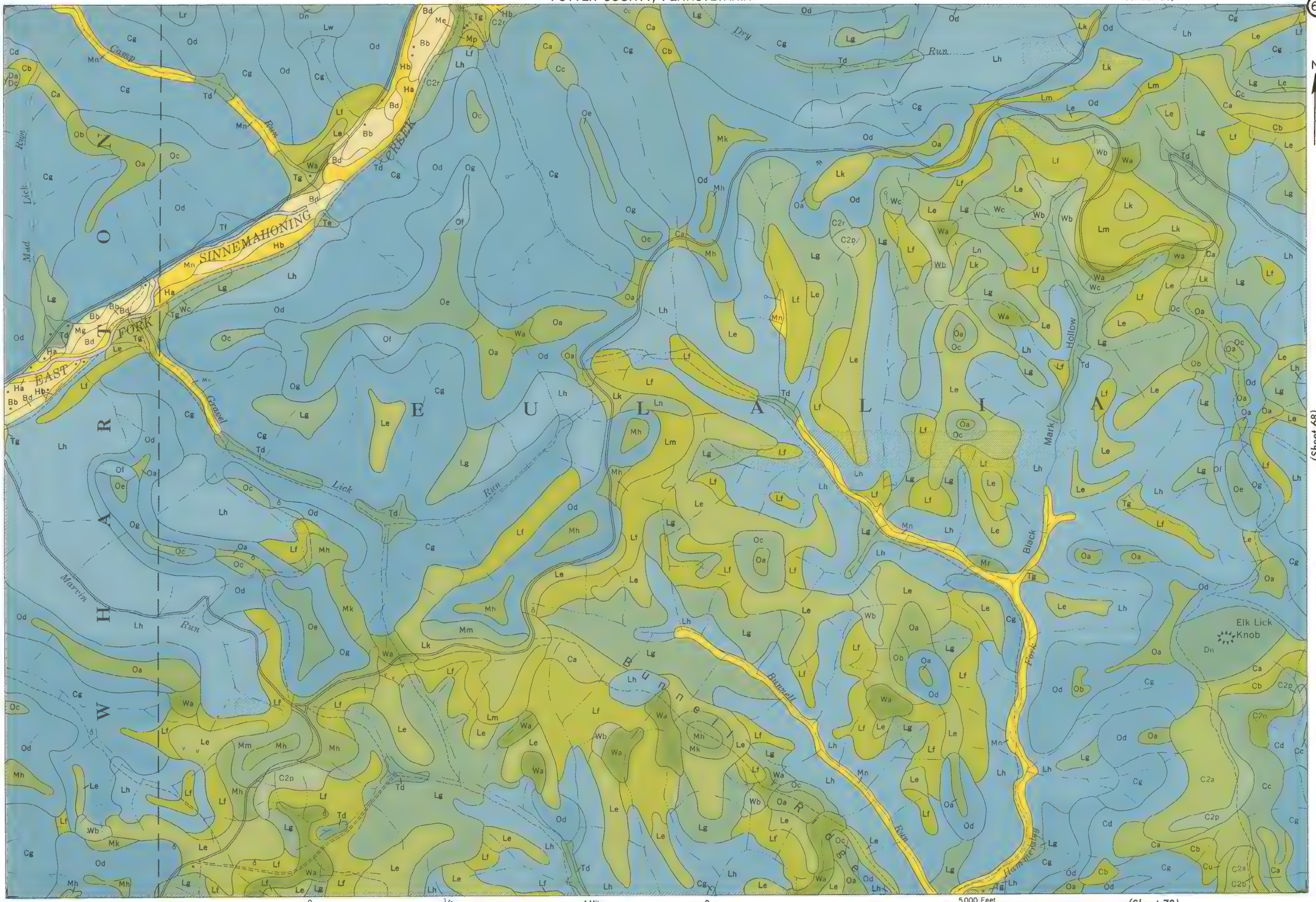
BROOKS CEMETERY

GAS

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet



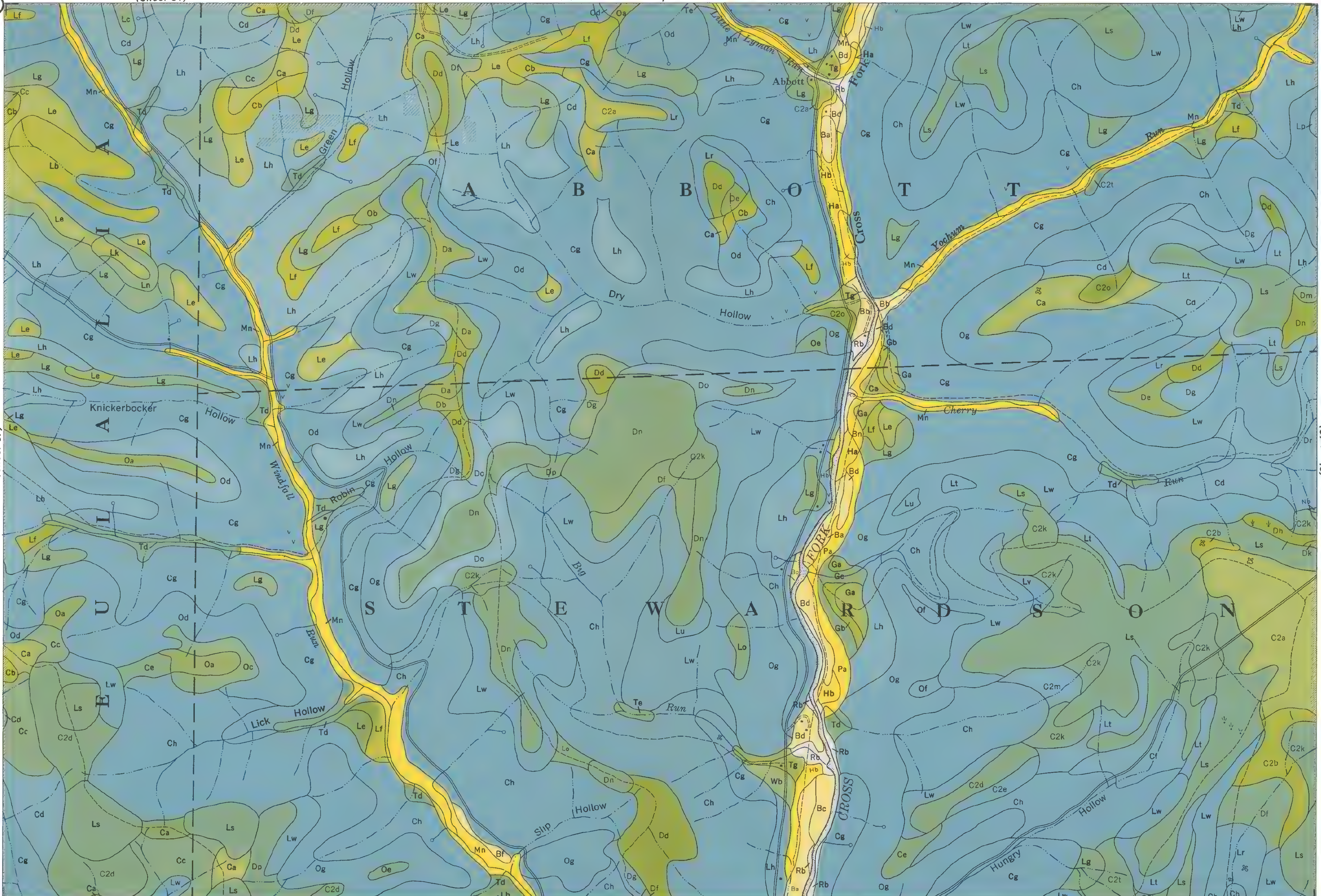
(Sheet 66)

(Sheet 68)

(Sheet 73)

(Sheet 61)

(Sheet 67)



(Sheet 69)

(Sheet 74)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Sheet 75)

(Sheet 63)

POTTER COUNTY, PENNSYLVANIA

N

CREEK

Indian Run

Warpath

Hollow

KETTLE

A B B O T T

Pipe Line

Hollow

Welch

Kramer

Hollow

GAS

GAS

S T E W A R D S O N

Francis

Hollow

Branch

Schoolhouse

Pigs Ear Branch

Brimmer

Branch

TIOGA COUNTY

LYCOMING COUNTY

(Sheet 69)

(Sheet 76)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

PORTAGE

WHARTON

CAMERON COUNTY

Brainard Hollow

Little Run

Barney Run

Berge Run

Barrett Run

Slide Hollow

Schoolhouse Dry Run

SINNEMAHONING CREEK

FIRST FORK

Road

State

Gas

N

(Sheet 72)

(Sheet 77)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Sheet 66)

POTTER COUNTY, PENNSYLVANIA

N

(Sheet 71)

(Sheet 73)

(Sheet 78)

FIRST FORK SINNEMAHONING CREEK

Wharton FORK SINNEMAHONING CREEK EAST

Avery Hollow

Elk Lick Run

Pine Island Run

Lower Vag Hollow

Upper Vag Hollow

Loshbaugh Run

Right Branch

Bell Branch

Tate Hollow

McConnell Hollow

Five Points

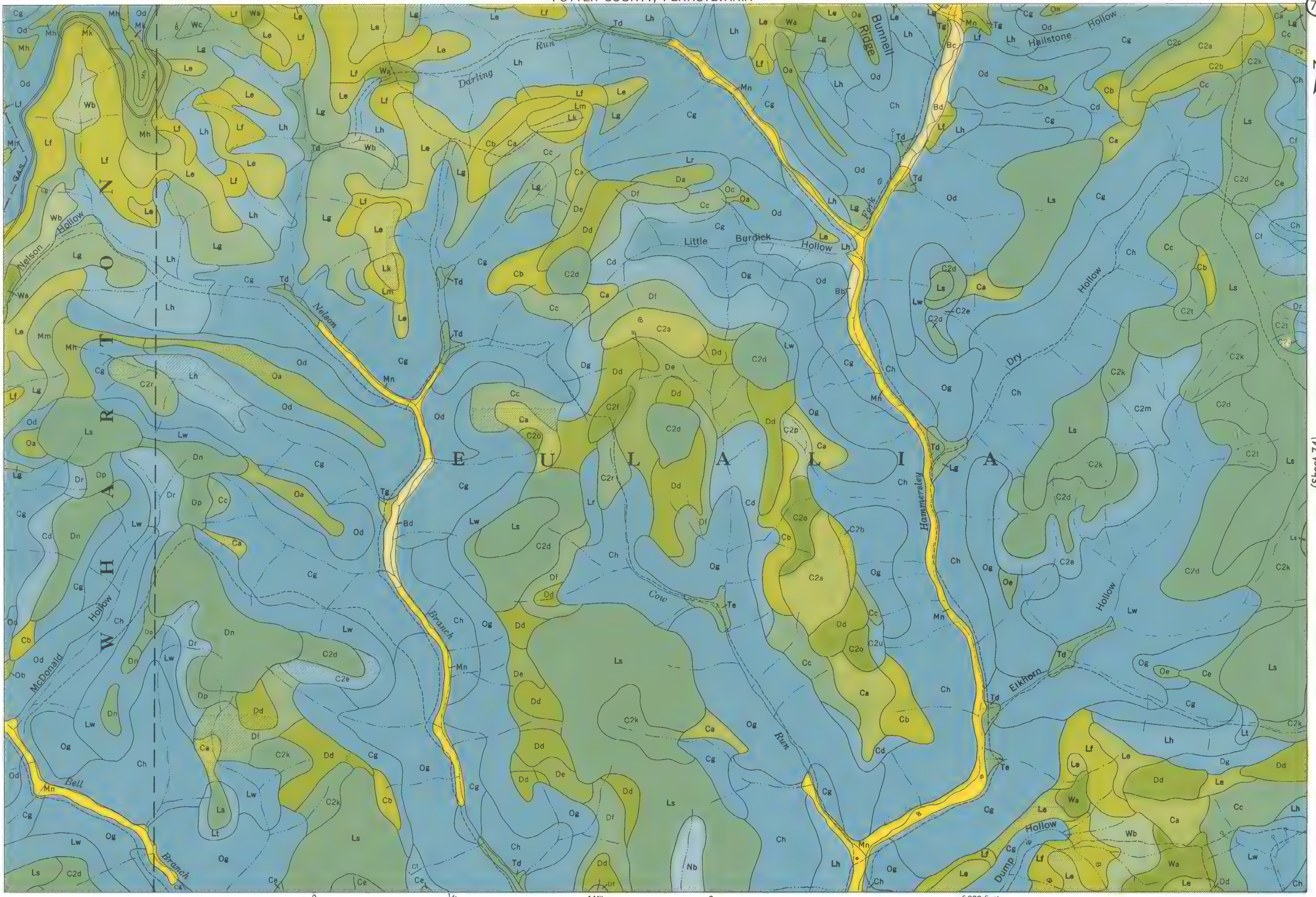
WHARTON

GAS

0 1/2 1 Mile

Scale 1:20 000

0 5000 Feet



(Sheet 72)
(Sheet 74)
(Sheet 79)

(Sheet 68)

N

(Sheet 73)

(Sheet 75)

(Sheet 80)

ALLEGANY

STEWARDSON

Blacksmith Hollow
Big Bench Hollow
Windfall Run
Hungry Hollow
Cassidy Hollow
Bergstresser Hollow
Elk Lick
Gravel Lick
Dyke Run
FORK
Rebel CREEK
Laurel Bottom
Keeney Hollow
CROSS Run
Gravel Lick
Batz Hollow
KETTLE
Bundle Hollow
Keeney Mountain

0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

N

OLE BULL STATE PARK

CASTLE RUINS

KETTLE CREEK

Lampson Hollow

Layfield Hollow

Rixford Hollow

Keeney Hollow

Big Pine Run

Little Pine Run

Spring Brook

Branch

Greenlick Ridge

GAS

STEWARDSON

(Sheet 74)

(Sheet 76)

(Sheet 81)

0 1/2 1 Mile

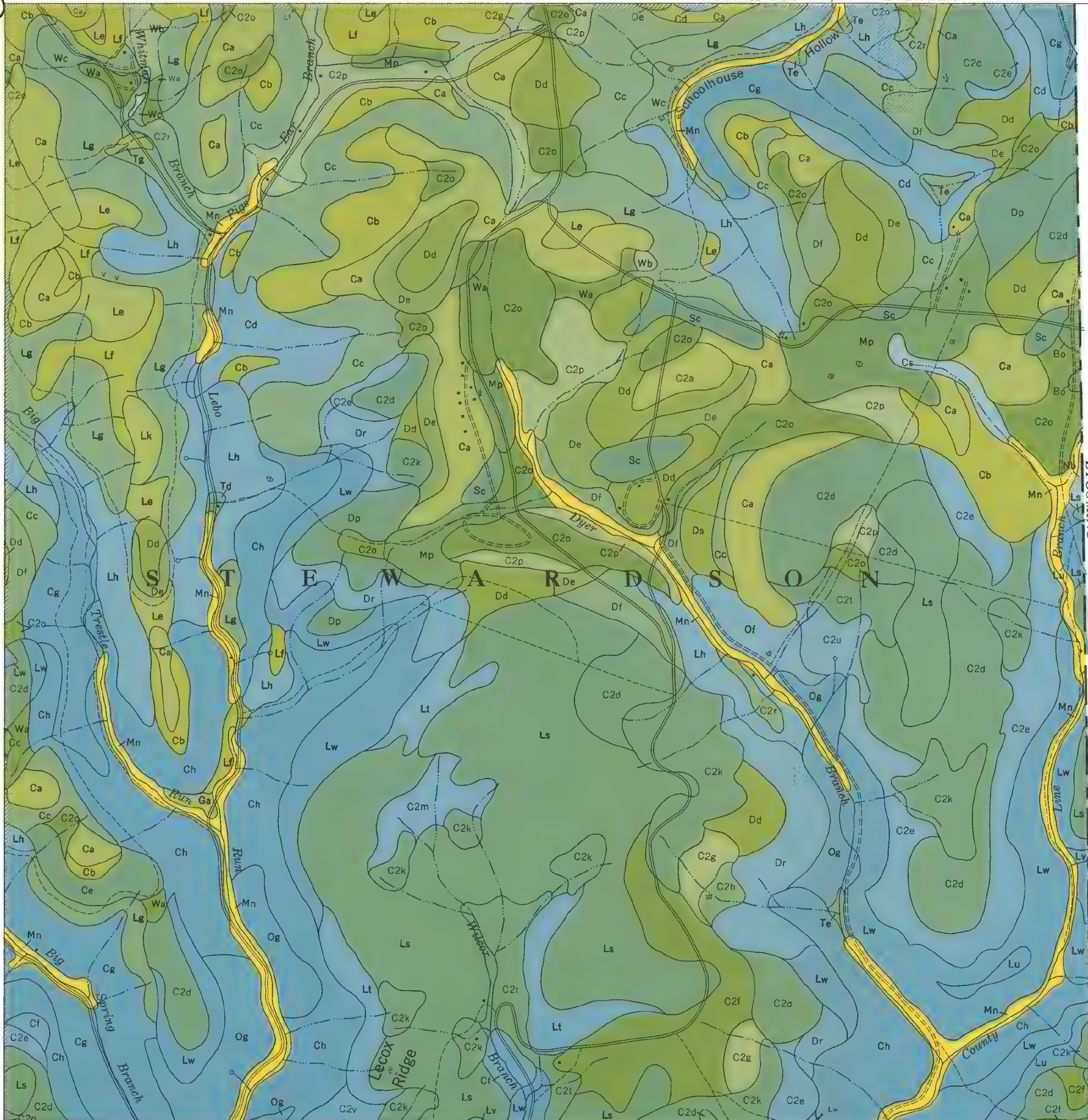
Scale 1:20000

0 5000 Feet

(Sheet 70)

POTTER COUNTY, PENNSYLVANIA

(Sheet 75)



(Sheet 82)

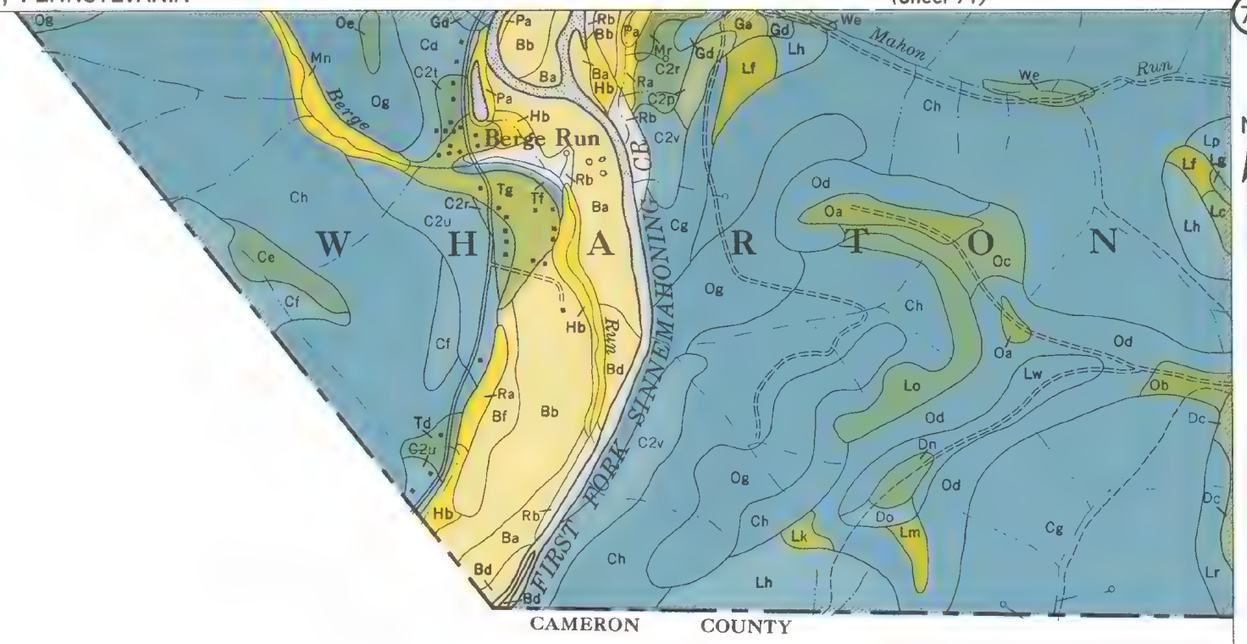
0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Sheet 71)

77



N

(Sheet 78)

0 ½ 1 Mile

Scale 1:20 000

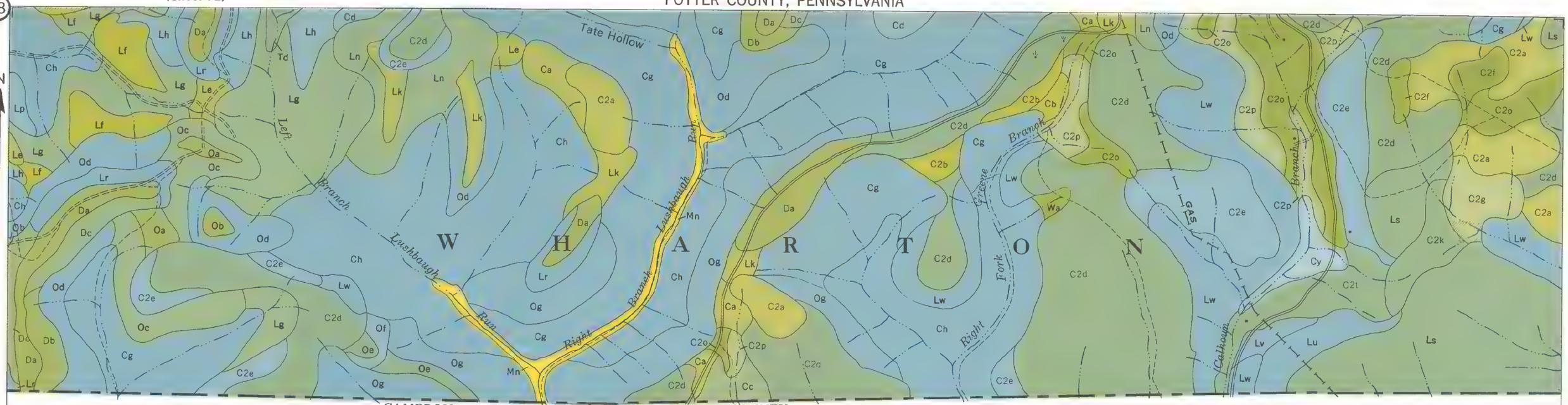
0 5000 Feet

78

(Sheet 72)

POTTER COUNTY, PENNSYLVANIA

N



CAMERON COUNTY | CLINTON COUNTY

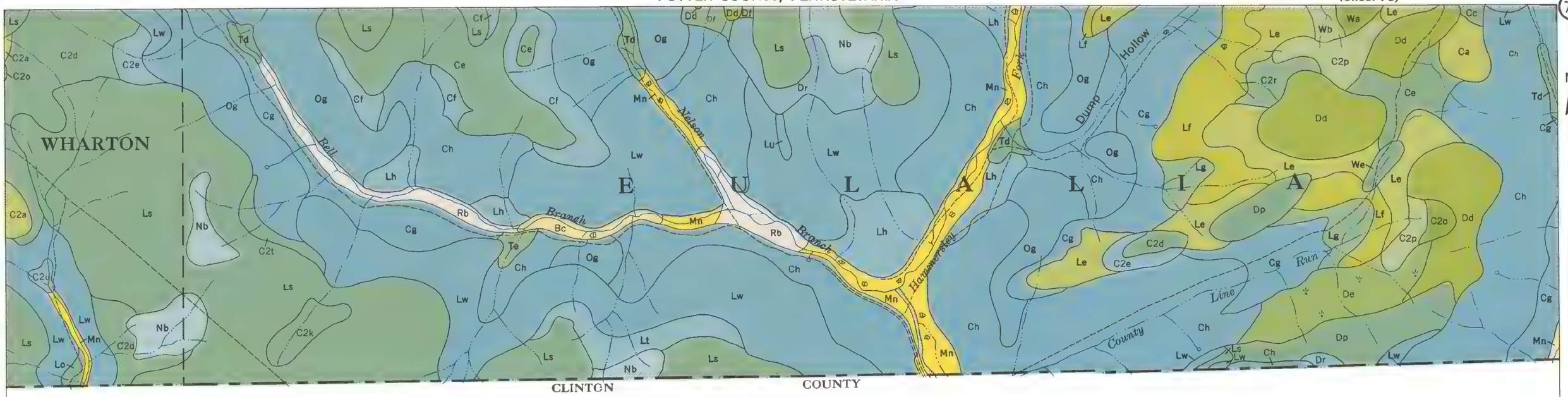
(Sheet 77)

(Sheet 79)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet



(Sheet 78)

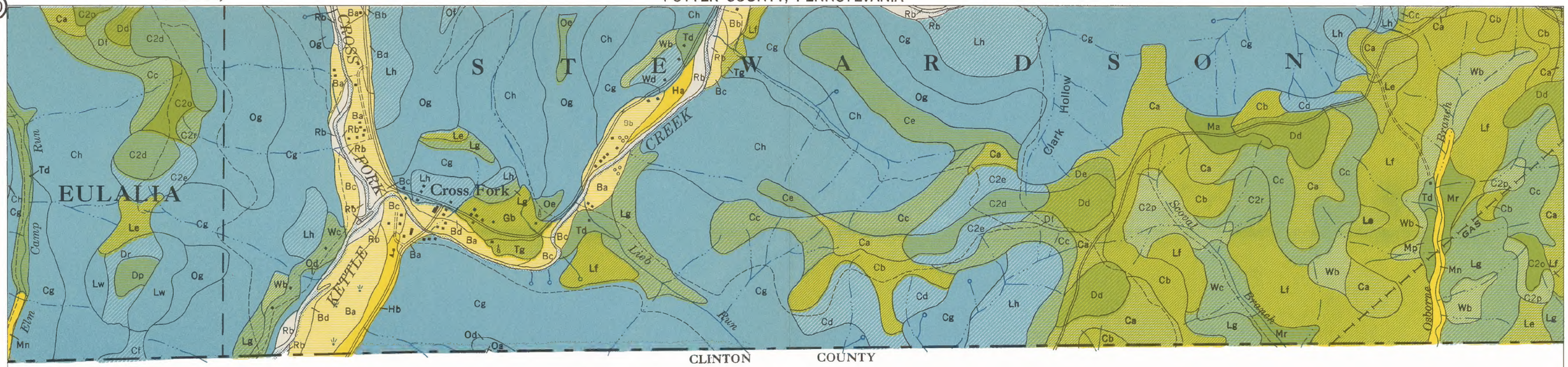
(Sheet 80)

N

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Sheet 74)

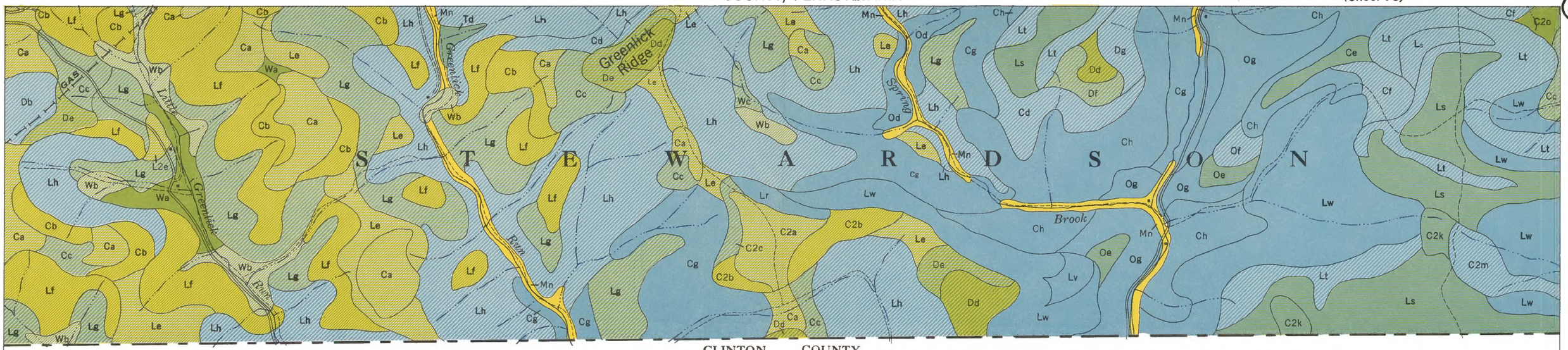
POTTER COUNTY, PENNSYLVANIA



(Sheet 79)

(Sheet 81)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet



CLINTON COUNTY

(Sheet 80)

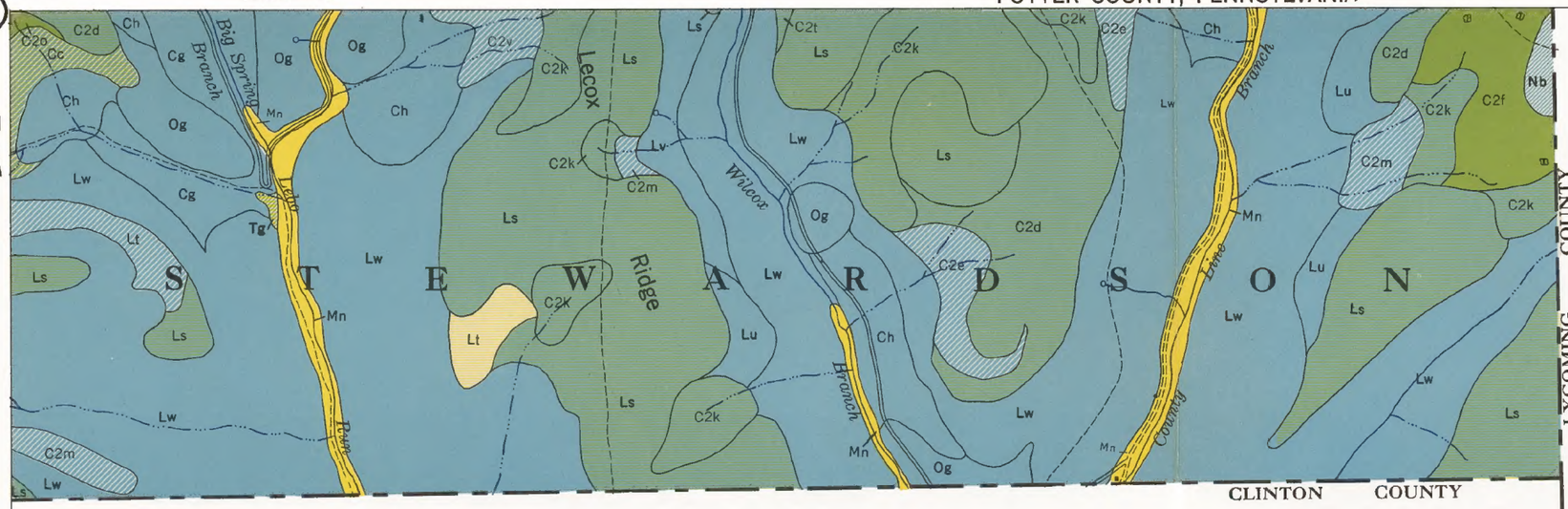
(Sheet 82)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Sheet 76)

POTTER COUNTY, PENNSYLVANIA

N



(Sheet 81)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

POTTER COUNTY, PENNSYLVANIA
CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Roads
- Good motor
- Poor motor
- Trail
- Marker, U. S. (33)

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mine and Quarry
- Shaft
- Dump
- Prospect

Pits, gravel or other

Power line

Pipeline

Cemetery

Dam

Levee

Tank

Oil well

Forest fire or lookout station

Canal lock (point upstream)

BOUNDARIES

- National or state
- County
- Township, civil
- U. S.
- Section
- City (corporate)
- Reservation
- Land grant

DRAINAGE

Streams
- Perennial
- Intermittent, unclass.
- Crossable with tillage implements
- Not crossable with tillage implements

Canals and ditches (CANAL / DITCH)

Lakes and ponds
- Perennial
- Intermittent

Wells (flowing)

Springs

Marsh

Wet spot

RELIEF

Escarpments
- Bedrock
- Other

Prominent peaks

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil type outline and symbol (Dx)
- Gravel
- Stones or rock ricks
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land

Erosion
- Uneroded spot (U)
- Sheet, moderate (S)
- Sheet, severe (SS)
- Gully, moderate (G)
- Gully, severe (GG)
- Sheet and gully, moderate (SG)
- Wind, moderate
- Wind, severe
- Blowout
- Wind hummock
- Overblown soil

Gullies

Areas of alkali and salts (A / M / S)
- Strong
- Moderate
- Slight

Free of toxic effect (F)

Sample location (● 26)

Saline spot